SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIV.--No. 19. [NEW SERIES.] NEW YORK, MAY 6, 1871. $3 per Annum. [IN ADVANCE.]

Improved Wheat Steamer and Dryer.

This is an application for steaming and drying wheat preparatory to grinding, so as to bring it to the exact hygrometrical condition to secure the best results in the manufacture of flour. It is constructed upon sound principles, and seems calculated to accomplish the end sought. It is simple in construction, and its operation will be readily understood by referring to the accompanying engraving, which is a vertical section through the apparatus.

A is the upper chamber of the apparatus, into which the wheat runs from a chute, the whole being fastened to the underside of a floor by bolts passing through the flange at the top of the steamer. The wheat falls down through the annular chamber, B, into the steam jacketed funnel-shaped chamber, C, whence it runs into the hopper of the mill, to be ground.

During its passage, it is either dried by means of steam heat, or steamed by the escape of steam into the interspaces of the grain, as may be required. This is accomplished by a series of pipes and chambers which we will now describe.

D is an annular steam chamber separated by an annular partition from the upper annular chamber, F. E is a central steam chamber. G is a conical steam chamber, with a perforated shell. The inner shell of the chamber, F, is also perforated. Steam from the boiler is admitted through the pipe, H; whence—if the wheat has only to be dried—it passes through short pipes into the inner chamber, E, filling both chambers, and finally exhausting through the pipe, J. The wheat is thus, in its passage through the annular chamber, B, subjected to radiated heat from both the chambers, D and E, which dries it to the extent desired.

If it be desired to steam the wheat, the pipe, I, is brought into action by opening its valve, and steam then entering the chambers, A and G, escapes through their perforated walls into the grain. By closing or opening the cock in the pipe, I, the required amount of steaming may be adjusted to a nicety, and the whole apparatus is under perfect control, so as to make the wheat grind as soft as is desired. The exhaust pipe, J, is also provided with a cock, which assists in the control of the heating power of the apparatus.

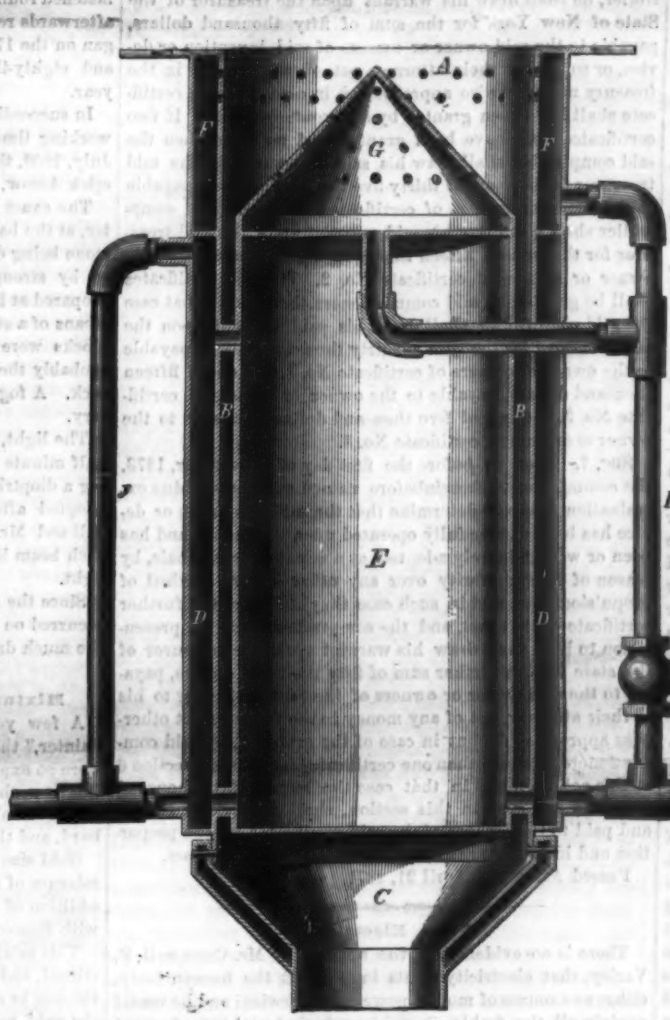
The following results are claimed as being obtained through the use of this apparatus, viz., that it enables the miller to adapt all kinds of wheat to his buhrs; that the flour produced can be bolted or dressed much cleaner; that the miller can grind higher and yet get all the flour, as the dryer expands the hull of the grain, effecting a partial separation between the starch and gluten; that the flour produced is more "grainy," while it yet retains the soft silky feeling so essential in flour for general baking purposes; that the bolting does not change so often, as the wheat is more uniformly ground, and, of course, bolts more uniformly; that in grinding soft wheat by the use of the drying part of the apparatus alone, as above described, the grinding may be higher and the offal cleaned; and, lastly, that the flour can be dressed as clean in cold weather as in warm.

We are informed that these claims have all been proved in practice, the apparatus having demonstrated its adaptability to the end sought by its use. It was patented, through the Scientific American Patent Agency, Sept. 27, 1870, by Cyrus T. Hanna, of Keokuk, Iowa, from whom further information may be had.

New Telegraphic Instrument.

A new telegraphic instrument, a modified form of Morse's, has been patented in England by Mr. Richard Herring. Mr. Herring is the author of the articles on "Paper and Paper-hanging," in Ure's "Dictionary of Arts and Manufactures." His instrument is furnished with two keys, one to work a lever carrying a pin, to make a dot, and the other to work a ever carrying a small linear stile to make a dash.

The London *Times* says: "Greater accuracy seems likely to be secured; for it now takes a very long time to acquire the art of releasing or holding down the key with accuracy. It will be much easier to learn to use two keys, one for the dot and the other for the dash, and to use them with the same rapidity. Mr. Herring suggests that it would be practicable to emboss two slips at the same operation, and to give one to the sender, who would thus know with certainty what message had been dispatched. The changes introduced by Mr. Herring may be almost regarded as matters of mechanical detail; but they seem likely to be of practical value and importance. To save nearly half the time now consumed in telegraphing, to give a compressed and easily legible dispatch in place of one that is always lengthy and often obscure, to make one tun of paper do the work of four tuns, and to remove a fertile source of inaccuracy, are promises, any one of which would call for careful investigation by the authorities."



HANNA'S WHEAT STEAMER AND DRYER.

We cannot agree with the *Times* in its estimate of the value of the above improvement. To clumsy or inexperienced telegraphers it may possibly be of advantage. But in this country where the use of paper has been discarded and messages are received by sound, it cannot be better, if as good, as Morse's single key.

BARTLETT AND BOOMER'S EXTENSION HEMMER.

It is claimed that this hemmer will form hems of any width,

whether on the finest cambric or on fulled cloth, or on intermediate fabrics. It is also claimed that it hems in the most perfect manner the edge of coarse cotton cloth when torn in two; also that it hems nicely, elastic worsted goods cut bias. It is further claimed that inexperienced operators can work it satisfactorily. It is designed for attachment to any of the first class sewing machines in market.

It is attached to the sewing machine with the point of the hemmer scroll, A, in front of the needle, as represented in the accompanying engraving. Then the notch, B, that will give the width of hem required, is set even with the hemmer scroll, A. Next, the cloth is passed between the plates C and D, around the end of the notched plate back into the notch, B. This is easily done by drawing the cloth backwards and forwards, until it forms the hem. Then the width being obtained, the end of the cloth is turned on the edge, drawn backward under the needle, and the presser foot is lowered. The cloth is then guided by the hand, as represented. The edge of the cloth should never be held; but it should be guided by taking hold of it six or eight inches from the hemmer, and letting it slide easily between the forefinger and thumb, half an inch from the edge—if the hem be half an inch in width; and one inch from the edge—if the hem be one inch in width; and so on.

Should the widest hems be required, the set screw, E, is moved to the end of the top plate, F.

This improvement was patented April 19, 1870, by Almore W. Boomer and John P. Haskins. Address for further particulars Bartlett & Boomer, Westfield, N. Y.

Fresco Painting.

In a lecture, "On Colors and Pigments," Professor Barff said: Experiments in fresco painting have been made in England, and from the result of these experiments, I am very much afraid that many of us have formed wrong impressions about fresco painting.

The ground upon which fresco is painted is a lime ground; and, in order to have a permanent picture, we must have a firm and stable ground. First of all, the wall must be absolutely dry; there must be no leakage of moisture from behind. Lime which has been run (as it is, I believe, technically called by builders) for a year or a year and a half, is best to be employed, for in proportion as the lime has been carbonated (though it must not be so to too great an extent) by the action of the carbonic acid of the air, it makes a better and a harder mortar. With this lime must be mixed river sand, of even grain; the sand should be mixed with water, and allowed to pass along down a small stream, so that in the centre of the stream you would have sand the grains of which would be pretty nearly equal in size. This is a point of considerable importance. The reason why new lime cannot and ought not to be used is because it blisters; small blisters appear on the surface, and that of course would be ruinous to a picture. A well plastered wall should not have a blister or a crack in it, and this is secured by having your lime run for some time, of good quality to start with, and mixed with good sand. There is no chemical process that I know of that takes place in fresco painting other than this, that silicates are formed by the action of the lime upon the the sand, and carbonates by the action of the carbonic acid of the air upon the lime.

In painting a fresco picture, inasmuch as there is no retouching the work when it is finished, the artist must make his drawing very carefully. The cartoon is made upon ordinary paper; then it is fixed against the wall, where the picture is to be painted. The part where the artist decides to begin his work is uncovered; that is to say, a portion of the paper is turned down and cut away, but in such a manner that it may be replaced. Then the plasterer puts fresh plaster, about an eight of an inch thick, upon the uncovered portion of the wall; and the plasterer's work is of the utmost importance in fresco painting. The workman ought to practice it well before he attempts to prepare the ground for a large picture, and I have found it of the greatest importance to allow the man to practice for several weeks before he was allowed to prepare any portion of the ground, even for decorative painting. In this way he becomes accustomed to the suction of the wall, and upon the suction of the wall depends the soundness of the ground and the success of fresco painting. When the plaster is first put on, of course it is very soft; the piece of the cartoon is replaced upon it, and the

lines of the picture are gone over with a bone point so that an indentation is made, and then the artist begins his painting. At first he finds his colors work greasy; you cannot get the tint to lie on, it works streaky; but you must not mind that, you must paint on, but you must only paint on for a certain time, for if you go on painting too long, you will interfere with the satisfactory suction of the ground, which is so necessary to produce a good fresco painting. Of course, nothing but practice can tell any one the period at which he ought to stop. I cannot describe it, because I should be simply trying to describe a sensation, which I cannot do. After some practice, you know perfectly well by the feel when you ought to stop. If you feel your color flowing from your brush too readily, you ought to stop at this period. You must then leave your work for a time, and go back to it again. And then you will find, as the plaster sucks in the color which you have first laid on, that there will be,—it may be in the course of half an hour, it may be an hour; that depends upon the temperature of the atmosphere,—a pleasant suction from your brush, the color going from it agreeably, and you will find that it will cover better. Now is the time to paint rapidly, and complete the work you have in hand. When the color leaves your brush as though the wall were thirsty for moisture, you should cease painting; every touch that is applied after that will turn out gray when it dies, and the color will not be fast upon the wall.

ONE HUNDRED THOUSAND DOLLARS REWARD FOR A NEW PLAN FOR CANAL PROPULSION.

The following is the text of the law recently passed by the Legislature of New York:

An Act to foster and develop the internal commerce of the State, by inviting and rewarding the practicable and profitable introduction, upon the canals, of steam, caloric, electricity, or any motor other than animal power for the propulsion of boats.

The people of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. George B. McClellan, Horatio Seymour, Erastus S. Prosser, David Dows, George Geddes, Van R. Richmond, Willis S. Nelson, George W. Chapman, William W. Wright, and John D. Fay, are hereby appointed a commission to practically test and examine inventions or any and all devices which may be submitted to them for that purpose, by which steam, caloric, electricity, or any other motor than animal power may be practically and profitably used and applied in the propulsion of boats upon the canals; said examination and tests shall be had by the said commissioners at such time or times during the season of canal navigation, for the year 1871–72, as they may order and direct; said commissioners shall have the right, and they are hereby expressly required, to reject all such inventions or devices, if, in their opinion, none of the said inventions or devices shall fully and satisfactorily meet the requirements of this act; but said commissioners shall demand and require: First, the invention or devices to be tested and tried at their own proper costs and charges of the parties offering the same for trial. Second, that the boat shall, in addition to the weight of the machinery and fuel reasonably necessary for the propulsion of said boat, be enabled to transport, and shall actually transport, on the Erie Canal, on a test or trial exhibition, under the rules and regulations now governing the boats navigating the canals, at least two hundred tuns of cargo. Third, that the rate of speed made by said boat shall not be less than an average of three miles per hour without injury to the canals or their structures. Fourth, that the boat can be readily and easily stopped or backed by the use and power of its own machinery. Fifth, that the simplicity, economy, and durability of the invention or device must be elements of its worth and usefulness. Sixth, that the invention, device, or improvement can be readily adapted to the present canal boats; and lastly, that the commissioners shall be fully satisfied that the invention or device will lessen the cost of canal transportation, and increase the capacity of canals by any means of propulsion or towage, other than by a direct application of power upon the boat, which does not interfere in any manner with the present method of towage on the canals, and, complying in all other respects with the provisions of this act, may be entitled to the benefits thereof; but this shall not be construed to apply to the system known as the Belgian system, or to any mode of propulsion, by steam engines or otherwise, upon either bank of the canal.

SEC. 2. No such test shall be made, if the same shall in any manner retard, hinder, or delay the passage of boats navigating the canals under the present system.

SEC. 3. If the commissioners herein appointed shall, upon each examination and test, as is provided for in the first section of this act, conclude and determine, at any time, that one or more inventions or devices aforesaid (but not to exceed three in number) shall be, in all respects, a full and satisfactory practical and profitable adaptation to the wants of the canals, by reason of a new, useful and economical means of propulsion for boats within the meaning of this act, it shall then, and not otherwise, be their duty to grant unto the owner or owners of such inventions or devices, his or their attorney, their certificate or certificates, under their hands as such commissioners, that they have so determined and adjudged.

To the owner or owners of the invention or device which, in the judgment of the said commissioners, possesses in the greatest degree of perfection the requisites mentioned in the first section, they shall grant a certificate which shall be known as certificate No. 1, and to the owner or owners of the next best invention or device, they shall grant a certificate as aforesaid, which shall be known as certificate No. 2, and to the owner or owners of the third best invention or device they shall grant a certificate as aforesaid, which shall be known as certificate No. 3.

SEC. 4. Before entering upon the duties of his office, each of the commissioners herein named shall take and subscribe an official oath, which shall be filed at once in the office of the Secretary of State; any vacancy, arising from any cause, in said commission, may be filled, on the application of the remaining commissioners, by the Governor.

SEC. 5. The reasonable expenses of the said commission, not exceeding in all the sum of five thousand dollars, to be determined by the said board, shall be paid out of any sum which may be awarded to the person or persons receiving the certificates mentioned in the third section of this act, in proportion to the amount awarded to the holders of said certificates, providing such certificates shall be granted; and if no such certificate shall be granted, then the same shall be paid by the treasurer, on the warrant of the comptroller, out of any moneys in the treasury not otherwise appropriated.

SEC. 6. Upon the production, by the owner or owners, of his or their attorney, of such certificate or certificates as may be granted under the provisions of this act, to the comptroller, he shall draw his warrant upon the treasurer of the State of New York for the sum of fifty thousand dollars, payable to the said owner or owners of said invention or device, or to his or their attorney, out of any money in the treasury not otherwise appropriated, in case but one certificate shall have been granted by said commissioners. If two certificates shall have been granted and no more, then the said comptroller shall draw his said warrant upon the said treasurer for the sum of thirty-five thousand dollars, payable to the owner or owners of certificate No. 1; and said comptroller shall also draw his said warrant upon the said treasurer for the sum of fifteen thousand dollars, payable to the owner or owners of certificate No. 2. If three certificates shall be granted by said commissioners, then and in that case the said comptroller shall draw his said warrant upon the said treasurer for the sum of thirty thousand dollars, payable to the owner or owners of certificate No. 1, and one of fifteen thousand dollars, payable to the owner or owners of certificate No. 2, and one of five thousand dollars, payable to the owner or owners of certificate No. 3.

SEC. 7. If on or before the first day of November, 1873, the commissioners hereinbefore named shall, upon due examination, find and determine that the said invention or device has been successfully operated upon the canals, and has been or will be largely adopted, as a motor on said canals, by reason of its superiority over any other known method of propulsion, then and in such case they shall grant a further certificate of that fact, and the comptroller, upon its presentation to him, shall draw his warrant upon the treasurer of the state for the further sum of fifty thousand dollars, payable to the said owner or owners of the said device, or to his or their attorney, out of any money in the treasury not otherwise appropriated; but in case of the granting, by said commissioners, of more than one certificate, as stated in section 6 of this act, then and in that case the sum of fifty thousand dollars, mentioned in this section, shall be divided among and paid to the owners of the said certificates, in the proportion and in the manner as stated in section 6 of this act.

Passed Assembly, April 21, 1871.

Vital Electricity.

There is no evidence, in the opinion of Mr. Cromwell F. Varley, that electricity exists in or about the human body, either as a source of motive power or otherwise; and he would explain all the feeble electricity which has been obtained from the muscles, as due to different chemical conditions of the parts of the muscle itself. The nerves are bad conductors, and are not insulated. The force which is transmitted by them cannot, therefore, be electricity; and the fact that this force is transmitted at a rate about 200,000 times slower than an electric current, is additional proof of their non-identity.

He contends that the sparks produced, in certain cases, by combing the hair, by drawing off silk stockings, or by rubbing the feet on a carpet, are illustrations of frictional electricity which in no way depends on vitality, but are due solely to proper conditions in the substances rubbed together, and in the atmosphere. In explaining how another form of supposed bodily electrification (which has led some to think that the brain is an electrical battery, sending electricity through the nerves to contract the muscles) may be produced, he states that if the two terminals of a very sensitive galvanometer are connected each with a separate basin of water, and if the hands be then placed one in each bason, on squeezing one hand violently a positive current is almost always found to flow from that hand, through the galvanometer, to the other hand, which is not compressed.

While experimenting, night after night, on this subject, in 1854, Mr. Varley found that, after squeezing the hand, opening the clenched fist produced a momentary increase of power instead of decrease; and when the wind was from the southwest, the power was less than one fourth as strong as when it was from the northeast. The former wind was found to be slightly negative to the earth; the latter was invariably powerfully electro-positive. On trying to exhibit those currents on one occasion, and finding them to be very weak, Mr. Varley washed his hands thoroughly in water containing a little liquid ammonia, in order to decompose the grease in the pores of the skin. The result was a diminution instead of an increase of the power. On washing his hands, however, with very weak nitric acid, and afterwards with water, he obtained more power on squeezing his hands than he had ever done during the most persistent east wind. This led to an explanation of the phenomenon, as one due to chemical action alone, the act of squeezing the hand violently forcing some perspiration out of the pores. By dipping one hand in a solution of ammonia, and the other in one of nitric acid, and then washing both in water, squeezing either hand produced a current in the same direction; and when both hands were placed in the water, and a little acid dropped upon both of them, a current was instantly generated, without any muscular exertion.

The Wolfe Rock Light House.

Since the year 1759, several very strong iron beacons had been swept away from Wolfe Rock—a dangerous, rugged porphyry rock, about nine miles south west of the Land's End, England, exposed to the full force of the Atlantic, and overflowed by the sea at high water—and it was determined to erect a lighthouse. In 1860, the design was furnished by the late Mr. James Walker, and its execution was first undertaken by Mr. Douglas, the engineer of the Trinity House, and his brother William, who succeeded him as resident engineer in October, 1862. On the 1st of July, 1861, Mr. Douglas commenced his first survey; and, on returning to the vessel that same day, was hauled on board through the surf by a line fastened round his waist—a mode of embarking frequently afterwards resorted to. The cutting out of the foundation began on the 17th of March, 1862. Only twenty-two landings and eighty-three hours' work could be done during that year.

In succeeding years more frequent landings, and increased working time, were obtained; and, at length, on the 19th of July, 1869, the last stone of the tower was laid by Sir Frederick Arrow, the Deputy-Master of the Trinity House.

The exact height of the tower is 116 ft. 4½ in. Its diameter, at the base, is 41 ft. 8 in. It is built of granite, each face stone being dovetailed horizontally and vertically, and secured by strong bolts of yellow metal. The stone work was prepared at Penzance, and conveyed to the rock in barges by means of a steamer; and in the latter portion of the time, the blocks were lifted into their position by a steam winch—probably the first employment of steam power upon a tidal rock. A fog bell weighing 5 cwt., is fixed on the lantern gallery.

The light, exhibiting alternate flashes of red and white at half minute intervals, is of a purely distinctive character, being a dioptric light of the first order; the arrangement being adopted after experimental observations by Professor Tyndall and Mr. James Douglas. The illuminating power of each beam is estimated at 31,500 English candles, or units of light.

Since the completion of the lighthouse, no shipwreck has occurred on the shores of Mount's Bay, or in the vicinity of the much dreaded Land's End.

Mixture for Gilding, and How to Use It.

A few years ago, says Arlot's "Manual for the Coach Painter," the processes for preparing carriages for gilding were so expensive, that only the most wealthy could afford it. But now, the process is the same as for ornamental striping, with the only difference that the under coats must be entirely hard, and the work done in a perfect manner.

Gold size may be used as a laying coat. However, the mixture of the house-gilders is preferable, and consists of an addition of white lead and chrome yellow, ground very fine with linseed oil.

This mixture must be used quite dry, that is to say, often stirred, and the brush or pencil pressed against the sides of the cup to remove all excess. A good mixture may receive the gold twelve hours after it has been laid down, and the same process answers for bronzing. When the gilder has delivered his work to the painter, the latter must wash it with plenty of water, taking care not to scratch the gold. It is better to wait three or four days before washing. The gold striping receives a first fixing with gelatine dissolved in water, and a second with white varnish diluted with turpentine. When all is dry, the portions of gold which may have stuck against the paint of the groundwork are covered with the same color; or, if we desire to avoid this extra work, we rub the body and gears with a sponge dipped into water containing finely levigated clay.

THE second artesian well sunk with a view of determining the thickness of the sulphur beds of Louisiana and the nature of the superincumbent strata, has reached a depth of 523 feet. At a depth of 428 feet it struck the sulphur-bearing stratum. This was 112 feet in thickness, made up of layers of pure crystalline sulphur, alternating with white limestone mixed with sulphur. These were surmounted by forty-one feet of white crystalline limestone, and underlaid by twelve feet of limestone containing some white sulphur. Prof. Hilgard advances the opinion that these deposits had their origin in reactions between gypsum and lignite, the former being in excess.

PREVENTION OF RUST.—Dr. Crace Calvert states that iron immersed for a few minutes in a solution of carbonate of potash or soda will not rust for years, though exposed continually in a damp atmosphere. It was believed long ago by soap and alkali merchants that the caustic alkalies (soda and potash) protected iron and steel from rust, but that the components of these salts preserved the same property as they do in a caustic state now. It does not seem to matter whether the solution be made with fresh or sea water.

THINKING AND SPEAKING.—The more a man knows, the less he is apt to talk; discretion allays his heat, and makes him coolly deliberate what and where to speak.

UNCOMMON FOOD.

We have condensed from *Good Health* the following upon the food of different nations and races. After briefly discussing the use of horseflesh as food (in France during the late war) and stating that 30,000 horses were eaten at Metz during the siege of that town, the writer goes on to say:

It is now about fourteen years ago that the late Isidore Geoffroy de St. Hilaire published a series of letters on alimentary substances, and the flesh of the horse, which was pronounced to be highly nutritious. The Faculty of Paris declared it to be in every respect equal to the flesh of any other animal, with the advantage, that the proportion of fatty substance was less than that of the bullock, and a strong gravy soup might be made, much easier of digestion, and in every way superior to that of beef. In 1858, what may be termed a "horse" banquet was given in Paris at the Grand Hotel du Louvre, which was presided over by the famous *gastronome*, M. Chevet, who had given the advantage of his culinary genius to the preparations. About sixteen persons partook of a variety of dishes, and they were pronounced ex cellent. In 1865 and the following year, equine banquets on a larger scale took place in Paris, and enthusiastic speeches were made by several well known naturalists, with a view to popularize the subject; and the sale of horse meat in the butchers' shops was permitted by an imperial ordinance.

In the retreat from Moscow, horse flesh furnished the French with the daily rations from the commissariat. In this matter the French have simply followed precedent of Germany, Russia, Belgium, Denmark, and other countries. In Austria, during 1863, nineteen hundred and fifty-four horses were slaughtered for food, and horse flesh has been eaten by different nations from remote periods.

A superior distinction in taste seems to be accorded to the flesh of the donkey, great numbers of which animals have been and are still slaughtered for food by the French. M. Darcel declares, it is to the horse that which veal is to the ox.

Monkeys' flesh is by no means to be despised, though this may seem to some persons a near approach to cannibalism. Mr. Bates, in his "Naturalist on the Amazon," describes the meat of the spider monkey as the best flavored he had ever tasted. It resembled beef, but had a richer and sweeter taste.

The predilection for dog eating is by no means confined to the Chinese, the Esquimaux, amongst others, vastly enjoying this food when the animals are young. A Danish captain who had acquired the dog taste, provided some of this food for a select party of guests, most of whom highly praised his *mutton*. Captain Sir. J. McClintock, who relates this story, adds that baked puppy is a real delicacy all over Polynesia. "At the Sandwich Islands, I was once invited to a feast, and had to feign disappointment as well as I could when told that puppies were so extremely scarce, that one could not be procured in time, and a sucking pig had to be substituted." The same writer bears unqualified testimony to the excellency of seal steaks when cut thin, and deprived of all fat.

The Malabar coolies are very fond of the "coffee rats," which they fry in oil or convert into curry. The pig rat is in similar favor. It attains a weight of two or three pounds, and grows to nearly the length of two feet. Rat pies are eaten in various parts of England; rat suppers used be given periodically at an inn near Nottingham. The porcupine is esteemed a delicacy in Ceylon, and in flavor much resembles a young pig. In Siam the flesh of the crocodile is exposed for sale in the markets. Alligators are sometimes eaten by the natives of South America, Africa, and South Australia. The taste of musk is, however, so strong that few strangers can eat them without being sick afterwards.

Elephants' hearts, we are told by Baldwin, in his "African Hunting," are very tender and good. The feet, baked in a large hole between bricks, are very glutinous and not unlike brawn.

In Peter Martyn's account of the voyages of Columbus, he mentions the disgust experienced by the Spaniards when at St. Domingo, on being invited by the Indians to taste their favorite delicacy the guana, considering it a species of serpent. This dislike was, however, soon overcome. "These serpents are lyke unto crocodiles save in bygness. They call them guanas. Unto that day none of owre men durst adventure to taste of them by reason of theyre horrible deformitie and lothsomness. Yet the Adelantado being entysed by the pleasantnes of the kings sister Anacaona, determined to taste the serpentes. But when he felt the flesh thereof to be so delycate to his tongue, he fel to amain without all feare. The which thing his companions seeing, were not behynd hym in greedynesse, insomuche that they had now none other talke than of the sweetnesse of these serpentes, which they affirme to be of more pleasant taste than eyther our pheasants or partriches."

Partiality for raw food seems to prevail in many countries. Raw fish, thinly sliced, formed one of the delicacies placed before Lord Elgin at a Chinese banquet. Baldwin tells us tells that the Kaffirs eat alternately a lump of roasted bull's flesh, and an equal quantity of the inside raw. A species of salmon, unknown in Europe, called in Siberia the nelma, is esteemed by the Russians more delicious in its raw state than when cooked, and is eaten to provoke an appetite. Ernan, in his "Travels in Siberia, says that during intense frost, raw flesh loses its repulsive qualities.

Wrangell adds his testimony to the superior flavor of raw frozen fish, seasoned with salt and pepper. Captain Hall says: My opinion is that the Esquimaux practice of eating their food raw is a good one; at least for the better preservation of their health. Eating meats raw or cooked is quite a matter of education.

The natives of the Sandwich Islands eat turtles, dolphins, flying fishes, etc., raw, considering that the flavor is lost in cooking, and the richest possible treat they can enjoy is to haul a fish from the water and literally eat it to death.

Sir Francis Drake says of the Patagonians, that they feed on seals and other flesh, which they eat nearly raw. Davis, in his second voyage to Greenland, in 1589, describes the natives as eating all their meat raw, drinking salt water, and eating grass and ice with great delight. Captain Hall, in his recent "Life among the Esquimaux," found the natives making a meal of smoking hot seal blood, and on tasting it, found it excellent, much to his surprise.

In new Guinea, the tripang, and similar marine slugs, are cut up into small pieces and eaten raw with salt and lime juice.

Locusts have been eaten from remote antiquity; the Arabs mix them with dough, and make excellent cakes of them. The Hottentots get fat upon them, and prepare from their eggs a brown or coffee colored soup. In the Mahratta country they are salted, and in Barbary they are preferred by the Moors to pigeons. The latter usually boil them in water for half an hour, throwing away the head, and wings, and legs; sprinkling them with salt and pepper, and frying them, adding a little vinegar. At Natal, the locusts are collected in the evening in sacks by millions, and afterwards steamed in close vessels over a fire, then dried in the sunshine, and after being freed from their legs and wings by a kind of winnowing, are stored in baskets in the granaries like corn. The dried locust is ground to powder between stones, and converted into a kind of porridge with water. It appears that the Kaffirs grow quite fat in the locust season. Dr. Livingstone tells us, in his South African travels, that for want of other food, he was compelled to eat locusts; and, strange to say, when roasted, he preferred them to shrimps!

Some entomologist tells us that caterpillars have a taste of almonds, and spiders of nuts. However this may be as regards the former, we are told by Spedman that large quantities of spiders, nearly an inch long, were eaten by the Kaffirs, and in the French colony of New Caledonia. In Europe there are instances of spiders exciting a kind of gourmand taste. Réaumur gives an instance of a young lady who never saw a spider without catching it and eating it. A clever woman—Anna Maria Schurman—used to eat spiders like nuts, as regards the cracking process, and excused her propensity by saying that she was born under the sign Scorpio. Lalande, the famous astronomer, was particularly fond of spider food; and a German is mentioned by Rozel, who used to spread spiders upon bread and butter, observing, in his imperfect knowledge of English, "that he found them very useful."

Humboldt tells us that he has seen Indian children drag out of the earth centipedes eighteen inches long, and more than half an inch broad, which they ate with eagerness. Insects' eggs are eaten by the Arabs and Mexicans; grubs of insects in the West Indies by both white and black men, who wash and roast them. The Mexican Indians prepare a liquor from the beetle, which has stimulating properties.

The Greeks ate grasshoppers, and liked them amazingly; the aborigines of New South Wales used to eat them raw, first taking off their wings. The Chinese thriftily eat the chrysalis of the silk worm, after making use of the silk; the larvæ of a hawk moth are also much relished. The blacks in Jamaica eat the Bagong butter flies after removing the wings, and store them up by pounding and smoking them. The Hottentots eat the termites, or white ants, boiled and raw, and thrive well upon them—the female ant in particular is supposed by the Hindoos to be particularly nutritious; and Broughton in his "Letters written in a Mahratta Camp in 1809," tells us that they were carefully sought after, and preserved for the use of the debilitated Lurjee 'Rao, Prime Minister of Scindia, chief of the Mahrattas. The natives mix them with flour, and make a variety of pastry: the method is to parch them in pots over a gentle fire, stirring them about as is done in roasting coffee. They eat them by handfuls, as we do comfits: the taste is said to resemble sugared cream, or sweet almond paste. "I have discoursed with several gentlemen," observes Smeathman, "upon the taste of the white ants, and on comparing notes we have always agreed that they are most delicious and delicate eating." Dr. Livingstone says "the white ants, when roasted, are said to be good, and somewhat resemble grains of boiled rice."

Humboldt mentions ants as being eaten by the Marivitunos and Marguerataree, with resin as a sauce. Bees are eaten in Ceylon. It is probably bad taste to allude to the mites that we consume in our cheese in myriads. The grub of the palm-weevil, which is the size of a thumb, is a favorite dish in some parts of India. Ælian relates of an Indian king, who for a dessert, instead of fruit, set before his guests a roasted worm taken from a plant (probably the larva of this insect), which was thought very delicious.

Improvement in Lead Furnaces.

What is claimed by the *London Mining Journal* as a wonderfully important improvement in the construction of furnaces for lead smelting, has been effected by Mr. George Metcalf. A vertical partition, or wall, extending for a portion of the length of the furnace and reaching from its crown to the sole, but not extending to the grate or fire bars, forms near this latter a bed which extends the whole breadth of the furnace, while it divides the remainder of the furnace into two compartments, in which the charges are placed, and are gradually led forward to the bed in front of the fire bars. The draft is shut off from each compartment alternately, one compartment being open to the chimney while the other is closed, so that while one set of charges is exposed to the free current of flame, or aeriform or gaseous products of combustion rushing from the fire through the compartments towards the chimney, the other set of charges is subjected only to the action of dead heat, because the draft apertures are closed. The ore, as it is fed in, dries and becomes calcined and wholly or partially desulphurized, as it is passed gradually along the chamber, till at length it reaches the bed or chamber in front of the fire bars. The greatest portion is then removed, in a state of slag or agglomeration, through an opening in the furnace, into a wagon, and is run off therein to a blast furnace, in order to be again subjected to further metallurgical treatment. What lead remains in the furnace is removed by tapping.

The result of the treatment is declared by competent judges to be, as near may be, perfect. The loss by volatilization is much less than usual, and the saving of fuel is enormous, five tuns with the new furnace doing quite as much work as twenty-six or twenty-eight tuns with the old reverberatory furnace.

In a previous number, says the *Exchange and Review*, we took occasion to refer to some of the mechanical and chemico-mechanical devices for collecting the matters volatilized during lead smelting and kindred metallurgical operations. It is questionable if, in this country at least, a proper realization of the vastness of the loss has been reached. Few steps have been taken to prevent such loss, and day after day furnaces pour forth their poisonous metallic smoke and fume with detriment to health and without regard to economical considerations. In England, careful estimates have been made of the amount of loss of metal in lead smelting, and the figures are scarcely credible. A blast hearth furnace treating 267,008 pounds of lead ore with an assay value of 73·73 per cent of metallic lead, and which therefore, should give 202,259 pounds, gave only 67 per cent, or 178,895 pounds. Here is at first a loss of 23,363 pounds, or more than eight per cent of the original assay content of the ore. To this is to be added a further loss in the refining process of 13·4 per cent, while the reduction of the dross from the refinery adds 3·6 per cent more, making the total loss more than twenty-eight per cent of the original amount of lead in the ore, corresponding to 57,643 pounds of lead volatilized from the ore during its treatment for, and conversion into merchantable lead.

Interesting Experiments on Color.

Dr. Clark Maxwell, F.R.S., recently exhibited some remarkable experiments on light and color. Although a mixture of blue and yellow pigments will produce a green color, the mixture of blue and yellow light produces white. He proved this by projecting two large disks of blue and yellow light upon the screen, and causing them to overlap each other; where they overlapped, the color was not green, but a pure white. He then interposed a lead pencil in the path of the rays from the two sources of colored light, so that a double shadow of it fell upon the screen, in the place where the two disks overlapped each other. The one shadow was a brilliant blue color, and the other pure yellow.

In another experiment he mixed red and green rays, and they formed a yellow as brilliant as the pure yellow of the spectrum; he proved this by throwing the pure yellow on to the screen immediately after the removal of the yellow produced by mixing red and green light. He showed that the pure yellow could not be decomposed by the intervention of a prism, whilst the yellow produced by the mixed rays could, by means of a prism, be resolved into the red and green rays of which it was composed.

In the course of the lecture he called attention to the fact that all persons have a yellow spot upon the retina, which tends to make color vision somewhat imperfect. The yellow is more pronounced in dark than in fair persons, and it has a tendency to impair vision more when the individual is tired and overworked than when he is well and active. To make the presence of this spot sensible to the observers, Dr. Maxwell threw a disk of light upon the screen, and colored the disk by making the light pass through a solution of chloride of chromium. The light thus produced is of a red color, mixed very largely with greenish yellow rays which are copiously absorbed by the yellow spot. He then told the observers to wink slowly at the disk, and they nearly all then saw large red cloud-like spots floating over the disk, in consequence of the absorption of most of the rays, with the exception of the red, by the yellow spot in the eye. When the disk was gazed at steadily without winking, the floating red clouds disappeared.

Testing Plated Metal.

To test the genuineness of silver plating on metals, a cold saturated solution of bichromate of potash in nitric acid is applied with a glass rod to the cleaned (with strong alcohol) metallic surface, and immediately washed off with cold water. If pure silver be present, there will appear clearly a blood red colored mark (chromate of silver). Upon German silver, the test liquid appears brown, and after washing with water the blood red colored mark does not appear; the Britannia metal is colored black; on platinum, no action is visible; metallic surfaces, coated with an amalgam of mercury, yield a reddish speck, which, however, is entirely washed off by water; on lead and bismuth, the test liquid forms a yellow colored precipitate; zinc and tin are both strongly acted upon by this test liquid, which, as regards the former metal, is entirely removed by water, while, as regards the latter, the test liquid is colored brownish, and addition of water produces a yellow precipitate, which somewhat adheres to the tin.

IT is a great guilt in any man to allow what mental faculties he may possess to become rusty from disuse, or to submit them implicitly to another.—MCCLINTOCK.

Crampton's Apparatus for Burning Coal Dust.

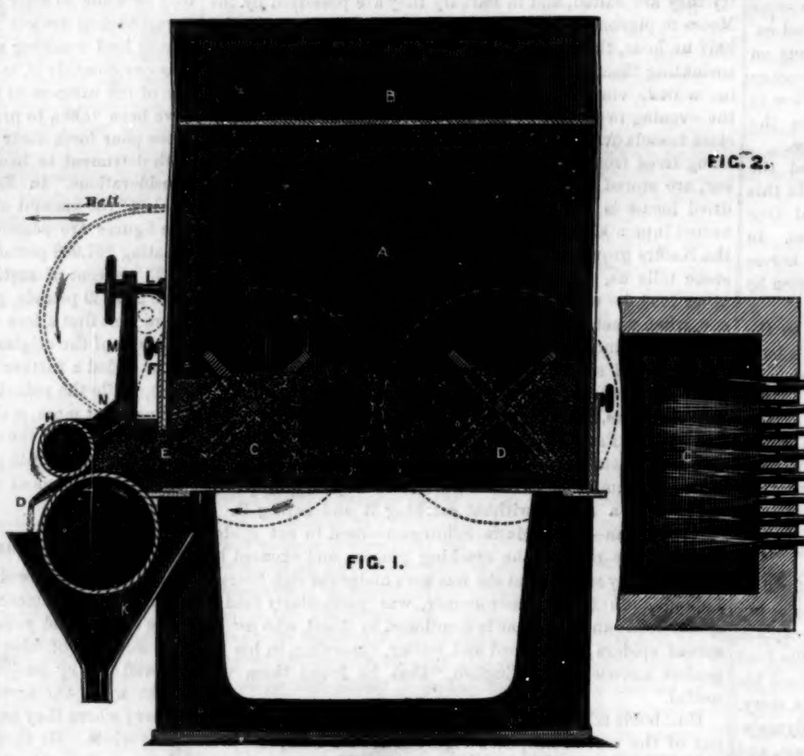
The idea of burning fuel in a powdered state is an old one, a patent for this method of consuming fuel having been taken out as long ago as 1831, while between that time and the present, about twenty other patents have been obtained for different methods of obtaining the same end. Several of these patents are for different modes of injecting the dust fuel by means of air, so that this method of feeding a coal dust furnace, which is employed by Mr. Crampton, is not in itself a novelty; but this by no means detracts from the credit due to Mr. Crampton, as he has been the first to produce a coal dust furnace which has achieved a really practical success, and has stood the ordeal of a lengthened trial. One great trouble met with by the earlier experimenters on the use of powdered coal, was the clogging of the flues by particles of unconsumed fuel, thus causing much inconvenience, as well as being a source of waste. This trouble has, however, been avoided by Mr. Crampton, simply by a recognition of the fact that a certain appreciable *time* is necessary for the combustion of a particle of coal, however intimately it may be brought into contact with the air.

If we suppose a jet of thoroughly mixed air and coal dust to be injected into a furnace, and suitably ignited, there will be produced a flame varying in length according to the velocity of discharge and the size of the particles of fuel; the greater the discharging velocity and the larger the particles, the longer being the flame. Now, in this case, the length of the flame forms a kind of measure of the time required for the combustion of the particles, and in order that this combustion should be complete, it is necessary that the arrangements employed should be such as to maintain the fuel and air in efficient contact during that time. The smaller the particles, the greater is the surface exposed by them in proportion to their weight, and the less, therefore, is the time required for their combustion, and the easier is it to insure that that combustion shall be perfectly effected. In other words, the smaller the particles, the more nearly will they approach the conditions of gaseous fuel. If, therefore, the process of grinding the fuel cost nothing, it would be advisable to reduce it to a perfectly impalpable powder, but commercial considerations forbid this, and it is found necessary practically to employ arrangements which enable the fuel to be burned in a less finely pulverized condition.

In order to obtain success in burning powdered fuel, it is essential, first, that the supply of the fuel to the furnace shall be under perfect control, and that it shall continue to be practically constant without personal attention, so long as a constant supply is required; next, that the powdered fuel shall be thoroughly mixed with the air by which combustion is supported; third, that the currents of flame must follow such a course as to enable the fuel to be completely burnt before the gases pass off from the furnace; fourth, that the combustion chambers and those parts of the furnace exposed to the intense heat must be of such construction as to be readily kept in repair; and fifth, that provision must be made for the collection and discharge of the slag arising from the impurities in the fuel. The modes in which these various requirements have been fulfilled by Mr. Crampton, we shall now proceed to explain.

Coal dust, particularly if it be in a slightly damp state, is by no means an easy thing to feed into a furnace regularly; but after trials of several arrangements, Mr. Crampton has designed and adopted a very simple apparatus for the purpose which answers its purpose perfectly. It is represented by the annexed engraving, and consists of a hopper fitted with a pair of smooth feeding rolls, as shown. The hopper, A, in which the powdered coal is placed, is fitted with a strainer, B, to prevent the entrance of large particles, and it is traversed by two revolving shafts, these shafts carrying stirrers, C D, which keep the coal dust in a loosened state. These stirrers revolve in the direction of the arrows, and thus force the powdered fuel through the opening, E, the extent of which is regulated by the sliding door, F. The opening, E, leads to the box, G, and the upper edge of the opening is kept below the top of the box, so that the fuel is not forced over the latter. If the box becomes full of fuel from the fact of the rollers not taking it away so quickly as it is supplied through the opening, E, the stirrers, C, D, not having force enough to increase the hight of the fuel in the box, G, will, as they revolve, merely agitate the fuel until the rollers have reduced the quantity in the box. From the box, G, the fuel passes between the rollers, H I, which feed it into the shoot, K, leading to the injector. The quantity of fuel fed by the rollers is regulated by means of a screw, L, which acts on the lever, M, and thence on the lever, N, to which are attached the bearings of the roller, H, this arrangement enabling the distance between the rollers to be modified as desired. As the rollers withdraw the fuel from the box, G, it is replenished by the action of the stirrers, the effect being that the fuel in the box, G, is maintained in a comparatively loose state, and furnishes a steady and uniform supply to the rollers, quite independent of the depth of fuel contained in the hopper, A. The rollers, it will be noticed, are fully exposed to view, so that any irregularity, in the supply passing over the scraper, O, can be readily detected. The fuel passing down the shoot, K, falls in a fine stream just in front of a jet, or series of jets, of air, which inject it into the pipe or pipes leading to the furnace. As an instance of the perfection of the arrangements just described, it may be mentioned that, at Woolwich, fifty consecutive heats have been turned out from Mr. Crampton's furnace—each heat averaging thirty cwt. of blooms—without the handles by which the supplies of air and coal are regulated ever having been touched.

In discharging the jets of mixed air and coal dust into the furnace it is essential that their direction should be such that an unequal distribution of the coal dust in the air, which may have been caused during its passage through the pipes, shall be remedied. Thus it is found that, when the mixed air and coal dust is carried round a bend in a pipe, the momentum of the particles of coal will cause them, on entering

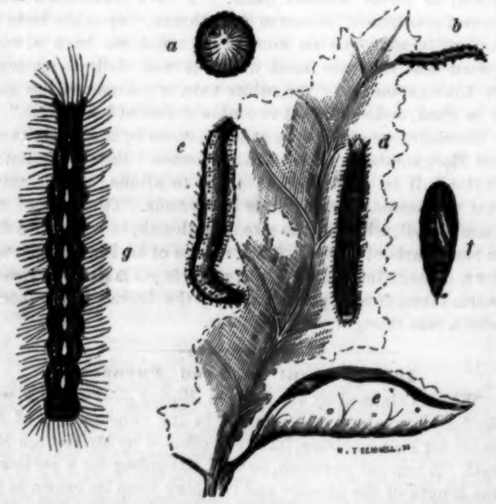


CRAMPTON'S APPARATUS FOR BURNING COAL DUST.

the bend, to be carried against the outer side of the latter. If, after passing the bend, the air and coal dust traverse a long straight length of pipe, they may get perfectly mixed again; but if they are discharged into a furnace directly after leaving a bend, it will be found that one side of the jet (that corresponding to the outside of the bend) will be overcharged with fuel, while the other side will be undercharged. If no means were taken to remedy this, the effect, of igniting such a jet, would be imperfect combustion; but Mr. Crampton has ingeniously converted this separating action into account to effect in some cases a perfect admixture of the air and fuel.

THE COTTON WORM.

The cotton worm (*Anomis xylina*—Say) is very generally known by the name of "the cotton *army* worm," in the South. The term, as applied to this species, is not altogether inappropriate, as the worm frequently appears in immense armies, and, when moved by necessity, will travel over the ground in "solid phalanx"; and, so long as the word "cotton" is attached—its ravages being strictly confined to this plant—there is no danger of its being confounded with the true army worm.



According to Dr. Phares, this worm destroyed two hundred tuns of cotton in the Bahamas, as long ago as 1788; while, in Georgia, it completely destroyed the crop of 1793. It also proved very destructive in 1804, 1825, and 1826. Since the last date, it has done more or less damage, almost annually, to the crop, in some part or other of the cotton growing district. As with the real grass-feeding army worm of the Middle States, it swarms in particular years to such an extent as to utterly ruin the crop; while in other years it is scarcely noticed. This fact has led many to infer that there is a staedt periodicity in its returns in such immense numbers; but the natural history of the worm confutes such an idea, and the records give no foundation for the inference. The sudden increase or decrease of this, as of other species of noxious insects, depends on climatic, as well as other equally potent influences

The egg, *a*, according to Dr. Phares, is shaped precisely like a skull cap, with rows of pinheads from base to apex, as thickly as possible," appearing as if molded in a very deep saucer. These eggs are of a translucent green color, and are deposited upon the under side of the leaves; and, from their small size, are difficult of detection. Each female moth deposits from 400 to 600. According to the late Thomas Affleck, they hatch two days after being deposited, if the weather be warm and moist.

The worms (*b*, one third grown) at first feed upon the parenchyma, or soft fleshy parts of the leaves, but afterwards devour indifferently, not only any portion of the leaves, but also the blossom-bud and blossom, together with the calyx leaves at the bottom of the boll, thus causing the lobes which hold the cotton to fall entirely back, and allow the cotton to drop at the slightest touch.

While young, these worms readily let themselves down by a web when disturbed; but when older, they make less use of this web, and jerk themselves away to a considerable distance when suddenly touched. They cast their skins at five successive periods, and come to their full growth, *g*, in the incredibly short space of fifteen or twenty days.

When they have completed their growth, the worms fold over the edge of a leaf, *e*, and after lining the inside with silk, change to chrysalids, *f*, which are at first green, but soon acquire a chestnut brown color; after remaining in this last state (in which, though the insect is inactive, it is yet full of life, and undergoes wonderful development) from seven to fourteen days, or even longer, the moth escapes, the chrysalis being held fast within the cocoon by means of several very minute hooks, with which the tail is furnished.

The general color of the upper surface of the moth is golden yellow, inclining to buff; the chief characteristic is a dark slate colored or black spot on the fore wings, in which spot there are paler scales, forming almost a double pupil, as represented in the figures, while between this spot and the base of the wings there is a much smaller pure white dot.

According to the best authority, there are three different broods of worms during the year, the first appearing in June or July, and the last, which does the most damage, appearing in August or September, or even later.

"That the cotton moth survives the winter is almost certain. An examination of the neighboring woods, especially after a mild winter, has often been successfully made for that purpose," says Mr. Seabrook; and Dr. Phares states positively that the moth hybernates in piles of cotton seed under shelter, under bark, and in crevices of trees, in dense forests and other secluded places, and that it may often be seen on a pleasant day in winter.

The only successful methods of destroying this injurious insect are by hand picking and by fire.

The World in the Ceiling.

A rounded house in the Strand, London, says *The Builder*, has its top room crowned with a small dome, and this Mr. C. Bowles, one of the firm of American bankers occupying the house, has caused to be painted with a map of the northern half of the world. It is exceedingly well and clearly done, and full of suggestion to those who view it with the mind. Little golden spots mark out the cities and towns; the railways, the telegraphs, through land and sea, are plainly seen, and the degrees of latitude and longitude are shown. The causes which have tended to raise towns and countries to importance, the enormous extent of the Russian empire, the importance of the Suez Canal, the extraordinary railroad recently completed across America, are a few amongst the points that are at once conveyed to the mind of the observer. The value of a silent teacher like this in a great school would be immense, and the idea might usefully be carried out further. Why should not the walls of educational establishments be decorated as we have, before now, suggested, with instructive diagrams, enlarged maps of countries, statements of leading facts in history, outlines of sciences, historical dates,—in fact mind excitents of all sorts? Anyhow, Mr. Bowles has turned his ceiling into what Byron calls the skull, a "dome of thought."

AN improved coloring matter for butter—carotine—has been successfully employed by Dr. Quesneville, as a substitute for annatto, to which it is in every respect superior, although somewhat more expensive. This carotine is the representative in carrot of alizarine in madder, and is obtained by slicing, drying, and grinding the roots to powder, exhausting the powder with sulphide of carbon, and, having removed the solvent, rapidly crystallizing out the carotine from the extract.

COMBINED MILK PAIL AND STRAINER.

This useful device is the invention of J. L. Drake, of Boston, Mass., and was patented in August, 1867. It is designed to secure greater cleanliness in milking, and to strain the milk while the milking is in progress. The receptacle for the milk is provided with a spout and funnel, a gauze strainer being placed across the lower end of the funnel tube. When the milking is finished, the funnel is removed, and the milk is poured out and strained. The funnel being brought up close to the udder of the cow, the milk is not rendered filthy by droppings of dirty water from the sides of the cow in wet

weather, and the receptacle, being placed out of the reach of the cow's foot, is not liable to be kicked over by a vicious animal. The pail can be also used as a stool for the milker.

Value of the Self-acting Mule.

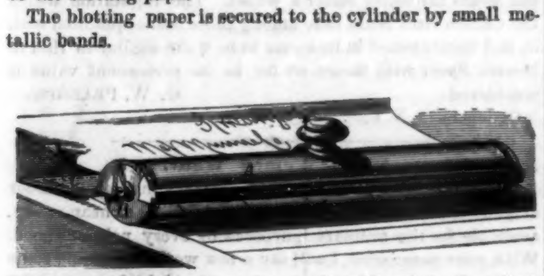
Through the skill of Mr. Roberts, of Manchester, England, the mule was made self-acting, the spinner not having now to work or guide the mule, but simply to see to its being kept in order. The value of these accumulated inventions will be seen, when it is remembered that before the invention of Hargreaves one person could only attend one spindle; at the present time one man, aided by a grown up youth and boy, will tend a pair of mules having 1,200 or 1,300 spindles in each, or 2,600 spindles together. If these facts be carefully examined, it will be seen that one individual, aided by the machinery of the present day, will produce as much yarn as 750 persons could have done a little over one hundred years ago; the result of these improvements being a large diminution in the cost of yarn, and a considerable increase of wages. A spinner in 1760 could only earn from 2s. to 3s. weekly, whereas now he can earn from 30s. to 35s. weekly. In the time of Crompton, which was after considerable improvements had been made in machinery, the cost of spinning weft 40 hanks to the pound was 14s. per pound; 60 hanks, 25s.; and 80 hanks to the pound, 42s. per pound. Now, the cost of producing will be 4d., 7½d., and 1s. per pound, respectively. Such are the advantages resulting from the invention of machinery.

COMBINED BLOTTER, RULER, AND PAPER CUTTER.

The annexed engraving illustrates a very neat and handy device for the counting room and the desks of professional men, including in one implement a blotter, ruler, and paper cutter.

The engraving is a perspective view, with a portion of the semi-cylindrical case, A, broken away, to show the spring which holds one end of the blotter roller, B. The other end of the roller is held by a fixed support, the spring bearing enabling the roller to be inserted or removed for the renewal of the blotting paper

The blotting paper is secured to the cylinder by small metallic bands.



The semi-cylindrical case has a wide thin plate, C, projecting backward, which forms the edge for cutting paper or tearing it across, as shown. The front side of the case has formed upon it a straight edge, which is the ruler. The roller being turned true, it—when rolled upon the paper—advances the ruler in lines constantly parallel to each other, as in the rulers hitherto constructed with rollers.

Patented, through the Scientific American Patent Agency, March 7, 1871, by Hugh S. Ball, whom address for further information, Spartanburgh, S. C.

MUSSEL CLIMBING.

By Rev. S. Lockwood, Ph.D., in the American Naturalist.

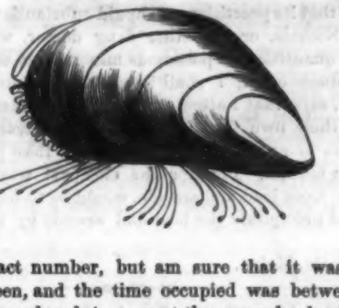
Why should not these pedate bivalves, the mussels, walk? "For want of brains!" says one. You are mistaken, sir. They have brains, the right kind, too, and in the right place—a real pedal nerve-mass, or ganglion; a little bilobed brain at the very base of the "understanding" itself, that is, exactly under the foot, as was fabled of a very agile dancer, that his brains were in his heels.

If seeing be believing, mussels can walk. We once saw a young brown mussel, of the species *Modiola plicatula*, about five eighths of an inch in length, turn his foot to a most excellent account. We had pulled the youngster's beard off, and then had deposited him at the bottom of a deep aquarium. The water was probably but poorly aërated, hence he was evidently ill at ease, and, to our astonishment, he at once began travelling over the pebbly bottom, then up the glass side, with the utmost facility and grace. The foot moved precisely as that of any univalve gasteropod would do, and with the same easy gliding motion. The movement was continued without interruption until he had reached the surface of the water, a distance of not less than 10 inches, which, added to the distance travelled over the bottom, was probably equal to 14 inches. At the surface he lost no time in spinning his byssus, which he fixed to the side for a permanent abode.

For his lively colors, perhaps ruthlessly, we had picked this little fellow out of a large family cluster, snugly packed in a little hole in one of the piles of the dock. It was a large group of all sizes, literally bound together by the silken cords of—attachment, shall we say?

A fellow captive was a full grown, black, edible mussel, torn from his anchorage, a stone near by, at low tide. We afterwards found, ensconced in this black shell, an amount of intelligence which filled us with astonishment. If his youthful fellow prisoner could beat him at walking, he was about to accomplish the feat of climbing to the same position by means of a species of engineering of a very high order.

Placed at the bottom of the aquarium, where he had been for a couple of days, he had succeeded in wriggling himself up to one of the glass sides of the tank. This accomplished, he protruded his large foot, stretching it up as high on the glass as he could reach, this organ seemingly adhering very tightly. A little hole opened near the extreme forward end of the foot. This tiny hole was really the extremity of a folded or closed groove. Out of this a drop of white gluten, or mucus, not larger than the head of a pin, was exuded and pressed against the glass. There was then a slight withdrawing of the foot, simultaneously with an unfolding or opening of the groove, which contained, as if molded there, the already completed delicate thread. This done, the partly contracted foot (not drawn into its shell at all, be it understood) was again extended, this time a little higher than before. The groove or spinneret was again closed, except the little opening on the surface of the foot, whence another little drop of mucus appeared, which also was pressed against the glass. Again the foot was withdrawn a little, the lips of the groove unfolded, and the molded thread set free. This gave thread number two. Each was evidently set at considerable tension. And in this wise, thread after thread was formed and set. (See engraving.) I regret that I did not



record the exact number, but am sure that it was about twelve or sixteen, and the time occupied was between two and three hours, when lo! up went the mussel, about three eighths of an inch high. Yes, he was drawn up by his own cords. He was literally lifted from *terra firma*. Not at all suspecting what was to follow, I mentally exclaimed "This little fellow knows the ropes."

There was next a period of rest. Whether it was due to exhaustion of material, and was meant to allow the secreting gland time to evolve a fresh supply or not, I cannot affirm; but I may say that such was my belief, for after an hour or so it set to work precisely as before, attaching a new cluster of threads. This cluster was set about ⅛ inch higher than the previous one. When this new group of filaments was finished, the same result followed, another lift of a fraction of an inch, but not quite so high as the first. I now suspected its motive—the animal was actually in this singular manner attempting to reach the surface. It wanted to take an airing, and was really in a fair way to bring it about.

While setting its third cluster of threads, I foresaw a serious difficulty in the way, and one against which the spider never has to contend. It was this: after the third lift had been achieved, the threads which had accomplished the first lift had changed direction; that is, the ends of the threads, which had pointed downward when pulling up the mussel, were now pointing upward, and were actually pulling it down. Of course the lowermost thread or threads would exert the most retrograde traction. Thought I, "Sir Musselman, you will have to exercise your wits now." I rejoice to say that the ingenious little engineer was complete master of the situation. The difficulty was overcome in this way—as each lowest thread became taut in an adverse direction, it was snapped off at the end attached to the animal. This, as I think, was done by two processes; the one by softening the end of the thread by the animal's own juices, purposely applied, as the pupa in the cocoon moistens its silk envelope, when wishing to soften the fibers, so that it can break a hole through which the imago may emerge; the other by a moderate upward pulling, thus breaking the filament at its weakest point.

The next day our little engineer had accomplished the wonderful feat of climbing to the surface by ropes fabricated during the ascent. Without delay it moored itself securely, by a cluster of silken lines, at the boundary where sky and water met, and was there allowed to enjoy the airing it had so deservingly won. Bravo! my little Mussel-man! No acrobat can beat thee on the ropes.

And what are we to say to all this? Blind instinct, forsooth! Who believes it? The wise men of the ages have written as the tradition of the elders—"byssus-bound," of our Mytilus. But it can make, of its bonds, mooring lines of safety against the storm, and with consummate skill can build a silken stairway into its own wished-for elysium of delight. It is some three years since the writer witnessed the facts here recorded, and to this day the sight of a mussel inspires him with profound reflection on the ways of Him who made these creeping things of the sea.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Wrought Iron Railway Sleepers.

The new railway sleeper recently patented by Mr. Richard Gammon, of Westbury, England, is likely, it is said, to supersede the whole of those at present in use, especially in tropical countries. The constructors of the railways in India experience the greatest difficulty in making and maintaining the permanent way. The dry rot, and those pests of India the white ants, destroy everything. Sleepers sent from England creosoted and "pickled," are not protected from the influence of the sun and vermin, and seldom or never last more than three years. It was necessary, therefore, to find a substitute impervious to attacks of insects, which might be made perfect and ready to be laid down wherever they should be required.

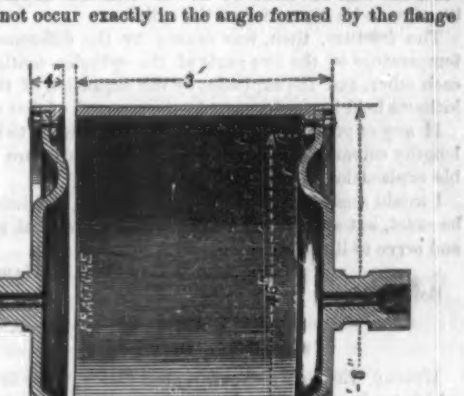
Mr. Gammon's sleeper is made up of a number of webs and plates of rolled iron, riveted together, and pierced with bolt holes for the chairs. This saves about two thirds of the labor of laying, and leaves but little work to be done by native or other labor. The direct cost is not more than 1s, each above that of the best wooden sleepers, and they are calculated to last ten times as long in tropical countries, and three times as long in Europe. Many eminent engineers and railway contractors, who have examined them, believe they will be the railway sleepers of the future. At all events, the invention is highly ingenious, and likely to supply a great want.

Explosion of a Cylinder for Drying Cotton.

MESSRS. EDITORS:—I had occasion recently to examine the ruins caused by the explosion of a cylinder, for drying cotton batting or carpet lining, at the factory of Geo. W. Chipman & Co., Charlestown, Mass., which occurred at about 2 P.M., April 8th. This explosion being so exceptional in its character, I thought it would be well to call the attention of your readers to the fact that cast iron is in many cases a very unreliable material for constructing cylinders exposed to high temperatures, and to withstand high pressures of steam.

The drying apparatus consisted mainly of two cylindric dryers, similar to those used in paper machines, rotated by gears, having a pipe passed through the right hand journal for admitting steam to the boiler, and a similar pipe in the other for removing the water; this drain pipe turned down wards and extended as low as possible in the cylinder, to keep it as free from water as possible, as is usual in arrangements of this kind. In addition to these dryers was a number of rollers carrying aprons for feeding the wet batting to the dryers, and for carrying it away.

The accompanying figure shows a section of the cylinder and the line of fracture. It will be observed that the fracture did not occur exactly in the angle formed by the flange



to which the head is bolted, but at a little distance, say ⅛ inch, from the plane of the flange, the angle being filleted. The larger part, weighing about 2,600 pounds, was thrown through the side of the building, and a distance of about 90 feet from the machine, plowing up the earth in its course; and the other part, weighing about 700 pounds, was thrown through the opposite side, and entirely through another building, at a distance of perhaps 50 feet. The building, of light wood work, containing the machine, was opened each way, and the attendant blown up through the roof by the force of the explosion, and considerably hurt and scalded, but not to such an extent as to endanger his life. On examining the premises about eighteen hours after the accident, I found everything as it had been left, the edges of the fracture, for about three quarters of the circumference, showing a clean break; the iron being of a bright gray color, corresponding to about No. 2 or 2½ pig, sound and good, with a uniform thickness of fifteen sixteenths of an inch; the other fourth of each part had been plunged into the ground; but, so far as I could judge, would, if clean, have shown the same charac

teristics as the rest. The heads were held on by being turned to fit the bored ends of the cylinder, and then each was secured by twenty-eight three-quarter bolts tapped into the flange. The boiler was an ordinary vertical cylinder, with internal fire box; diameter, 42 inches, thickness of sheets, one quarter inch; and was single riveted.

The safety valve worked freely, and was weighted, as nearly as I could judge without seeing the valve itself, at 90 pounds. I could get no reliable evidence as to the pressure carried at the time of the explosion, except that "they were doing all they could." I then made the following calculations, to determine, for comparison, the bursting pressures: And first of the boiler: Taking the maximum tensile strength of boiler plate at 60,000 pounds per square inch of section, and the single riveted joint at half this, or 30,000 pounds, we have $\frac{\frac{1}{2}\times 30,000}{42}=357$ lbs. per square inch as the steam pressure required to burst a longitudinal seam of this boiler, provided, of course, that there is no vibration under this load. The safe working pressure, I may here remark, was one sixth of this amount: $\frac{1}{6}\times 357=60$ pounds per square inch.

Of the pressure required to part the 28 tap bolts sustaining the pressure upon the heads of the dryer cylinders, we take 60,000 pounds to express the tension, required to part a bolt having a sectional area of one square inch cross section; in this case the thread cut on the three-quarter inch bolts reduces their diameters for strength to five eighths of an inch; the sectional area of each, then, is 0·3 square inches. The diameter of the head, acted upon by the steam pressure, was 46 inches; its area, then, is 1,662 square inches. Then $\frac{\cdot 3\times 28\times 60,000}{1,662}=303$ lbs. pressure per square inch. Again, supposing the cast iron cylinder to have been pulled apart by a longitudinal strain, what steam pressure would have been required? Diameter minus approximate thickness $54-1=53$ inches, the circumference of which is about 166 inches, $166\times\frac{15}{16}=156$ square inches of section of metal broken. Then taking only 16,000 pounds as the tension required to part a square inch of this metal, we have $\frac{16,000\times 156}{2,124}=1,100$ pounds per square inch, the 2,124 being nearly the area of a circle 52 inches in diameter, which is the size of the inside of the cylinder. We find, therefore, that this part of the system is nearly three times stronger than any other part, and if a rupture had occurred from simple pressure, it would have been either in a vertical seam of the boiler, or by parting the bolts of the cylinder head. We must then look for another cause. The steam pressure was most likely at some point above 80 pounds. The temperature of steam at 80 pounds is about 312° Fah.; at this temperature, the heads and about four inches of each end of the cylinders was kept. The remaining part must have been cooled by its girdle of damp batting to at least 232° and perhaps 212°. The rate of expansion for cast iron is given at ·000006 times its length for each degree above 32°; then if the diameter of the cylinder at 32° temperature was 54 inches, at 232°, or 200° higher, it would be $(54\times 200\times\cdot 000006)+54=54\cdot 0648$, and at 312°, or 280° higher, it would be $(54\times 200\times\cdot 000006)+54=54\cdot 0907$—a difference of ·026, and quite enough to cause a fracture, if this difference of 80° temperature occurred in a well defined line round the cylinder. The explosion took place when the rotation of the cylinders had been stopped for a moment, they being encircled by the wet or damp batting, and the fracture followed the line marked by its edge, in its course round the cylinder.

The fracture, then, was caused by the difference in the temperature of the two parts of the cylinder contiguous to each other, and the explosion by the expansion of the steam hitherto held in confinement by the strength of that cylinder.

If any of your readers should take the trouble to read this lengthy communication, and can suggest any more reasonable explanation, I would like to see it.

I would remark that my calculations are not intended to be exact, but approximate sufficiently for practical purposes, and serve to illustrate my theory.

WM. N. HARRISON.

Boston, Mass.

Simplicity in Design.

MESSRS. EDITORS:—Next to good fitting, there is nothing which tends so much to the good repute of a mechanic and his products, as persistency in some simple form or style in the finish and ornamentation of his work.

If the work be a machine, all of the visible shaft, bolt, stud, and nut endings should be turned or milled carefully to the same general shape or form. There is nothing so neat and appropriate as the simple reverse curve style, free from corner or bead.

Inward corners should always be avoided. There is nothing so discouraging in machine cleaning as complicated beadings, or in house cleaning as complex moldings; they are only dirt catchers, void of beauty.

It is no light task to keep a complex machine like the railway engine clean and tidy; the finish and ornamentation of such machines should, by all means, be made as simple as possible. Neatness and utility should be the only objects in their construction, and all elaboration in the way of show should be avoided.

I have often questioned the propriety of using so much brass in the external finish of locomotives; it tarnishes so easily, that an almost continual rubbing is necessary to keep it bright, imposing a tremendous tax on patience and muscle. Paint and varnish judiciously applied occasionally, especially to all of the large surfaces, such as cylinder and steam chest casings, would be far more neat, economical, and satisfactory.

F. G. WOODWARD.

Poisonous Fertilizers.

MESSRS. EDITORS:—The editor of the Boston *Journal of Chemistry* quotes my article on poisonous fertilizers, from page 372 of the last volume of the SCIENTIFIC AMERICAN, and makes the following remarks:

The above absurd item has been "going the rounds" of the press during the past six months, and it is quite time that it was stopped. This attempt to frighten farmers who are enterprising enough to dissolve bones and prepare their own fertilizers is hurtful to the interests of agriculture and derogatory to science. In the ordinary sulphuric acid of commerce, which is made from Sicilian sulphur and condensed in platinum retorts, the amount of sulphate of lead present is but a mere trace, seldom exceeding one fourth of one per cent. The same may be said of arsenic; some specimens of acids from the best makers do not afford even a trace of this metal or any of its salts. The dunce who started this item, probably read in some old book or journal that specimens of acid, prepared in England some years ago from iron pyrites, were found by Dr. Rees, Mr. Watson, and others, to contain arsenic, and hence seized hold of the idea of making a sensational article on "poisonous fertilizers." Such loose statements are fraught with evil, and cannot be too severely condemned. It may be said that the quantities of lead and arsenic found in the worst specimens of commercial acid would not have the slightest influence upon crops, when presented through the medium of superphosphates. Farmers and horticulturists need have no fear of deleterious effects from the use of any of the acids found in the market.

I never supposed the quantity of lead or arsenic present would produce any immediate perceptible results; and unless friend Nichols denies that small quantities of poisonous minerals accumulate in the body, he surely has no good reason for the assertions that he makes.

Professor Davy, alluded to in my former letter, says: "As arsenic is well known to be an accumulative poison, by the continued use of vegetables containing even a minute proportion of arsenic, that substance may collect in the system till its amount may exercise an injurious effect on the health of men and animals."

In an editorial article, on page 215, Vol. XXI., the SCIENTIFIC AMERICAN says: "Lead is one of the most insidious of poisons, accumulating little by little in the system through long periods of time."

And I see no reason why arsenic, lead, and all other poisonous minerals capable of forming insoluble compounds with sulphur, or with phosphoric or carbonic acids, may not meet these in the blood, and thus become fixed. I might produce more evidence to show that poisons accumulate and thus produce injury, but will not occupy space to do it at present.

It is evident that, if my conclusions are right, the old-school practice of medicine is at fault; and it appears important that its practitioners should substantiate their views. If Dr. Nichols, or any other drug doctor, will prove that minute quantities of poisonous minerals do not accumulate and produce harm, I shall be most happy to be convinced.

Dr. N. says that I attempted to frighten farmers from preparing their own fertilizers. On the contrary, I would advise them to prepare their own, rather than purchase those found in market. Perhaps the cheapest way of getting an acid free from lead and arsenic, would be to buy the cheapest acid and precipitate the lead and arsenic by hydrosulphuric acid.

H. A. S.

Charlotte, Maine.

The Use of the Jar in Boring for Oil.

MESSRS. EDITORS:—In your issue of April 15th, there is an article, copied from Blake's "Notices of Mining Machinery," in which there is a mistake with regard to the operation of the "jars" used in oil well boring. "By it (the jar) a blow or sudden jerk may be given upwards, so as to loosen the bit in case it becomes wedged in the hole, while the same device serves to give a blow downwards upon the auger, after the bit strikes the bottom, thus doubling the efficiency of each stroke."

It is not the office of the jars to strike both ways, except on special occasions. When the tools stick, in running down, as is often the case with a "reamer," the jars are struck downwards for the purpose of driving them through the "tight place." The jars are sometimes worked both ways for the purpose of wearing a tool loose that has become fastened on the bottom; but otherwise, in the language of an old driller who read the article, "If they should 'ketch' a man working his jars both ways, in the oil country, they would hang him."

The jar was originally introduced for the purpose of knocking the tools loose, when sticking, and are worked, when all is going right, about three or four inches. More than this is useless, and less does not give the driller to understand whether or not the drill is striking the bottom, especially if working a deep hole.

J. W. SADLER.

Tidoute, Pa.

How to Build a Chimney.

MESSRS. EDITORS:—In looking over your excellent paper of March 18th (page 180 of current volume), I noticed an article, written by Austin B. Culver, of Westfield, N. Y., upon the construction of chimneys, to which I fully subscribe, so far as he goes; but I think that he has overlooked one important matter, which, no doubt, has been the cause of more fires than any other which has come to the notice of the public. That is the improper construction of the water table, made by projecting one course of bricks on each side of the chimney, about an inch over the body of the chimney, at a point where the chimney was brought through the roof. The error is in making it too low. Chimneys are generally built before the building is shingled, and proper allowance is not always made for the thickness of the shingles; hence they are crowded up tight under the water table. If the chimney settles more than the building, or if it be a flue, built upon any part of the wood work, or upon a flue stone resting upon joists too weak to sustain the weight, the result is the separating of the chimney by the water table resting upon the shingles, thereby making an opening at a very dangerous point, where burning soot or sparks can most easily communicate to the shingles.

ISAAC BRADFIELD.

Pomeroy, Ohio.

Early Railroading.

MESSRS. EDITORS:—On page 242 of the present volume of the SCIENTIFIC AMERICAN, there appeared an article giving some statements in regard to early railroading, in connection with the name of William Hambright as an old conductor. The facts recited recal the nearly analogous case of the Baltimore and Ohio Railroad, and Captain John Mitchell, of Baltimore. The Lancaster Railway was one among the first railways in this country, but not the first one.

According to my authorities, the first railway was a rather inferior one, which ran a short distance out of Boston. Then followed the Baltimore and Ohio Railroad, whose charter is dated in 1824, and the corner stone of which was laid at Baltimore in 1828. This road ran originally to Ellicott's Mills, a manufacturing site about ten miles from this city, and an attempt was made to use wind sails as the means of propulsion on the road, but they were speedily abandoned for horse power; and, some time after, two locomotives with upright cylinders—commonly called "grasshoppers"—were imported from England. The road extended in 1830-1 to Frederick City, Md., a distance of sixty miles; thence it was laid to Cumberland, and finally to the Ohio river.

John Mitchell, a well known citizen, was appointed mail agent by Hon. Amos Kendall, postmaster general, in 1837, being the first railroad mail agent under the United States government. His route lay from Washington to Philadelphia. He was paid a salary of $800 per annum, and he alternated on the route with John E. Kendall, a nephew of the postmaster general. Capt. Mitchell occupied his post a short time, when he resigned to accept the office of high constable of Baltimore, a position which he held for several successive terms. He is now the captain of one of the police districts of this city, and still a hale, hearty, and active gentleman and officer.

G. W.

Baltimore, Md.

Wooden Railways.

MESSRS. EDITORS:—Noticing considerable discussion in your columns on the subject of wooden railroads, I wish to offer some results of my experience, touching the difference in the material used.

At the Marine Railway at this place, the carriage used in hauling out vessels is 300 feet long; as few vessels on the lakes are over half this length, and the upper part of the carriage is but little used, the track for some years was made of hardwood plank, 2 inches thick by $7\frac{1}{2}$ inches wide, laid upon heavy oak stringers. These planks were rock elm, white oak, and hard maple. So long as they had but to carry the weight of the carriage, they all worked well, but as soon as we began to handle vessels on the upper part of the carriage, the elm and oak plank commenced peeling and winding around the rollers, causing considerable trouble. The maple continued to work well until the whole was replaced by iron.

Here the movement is of course very slow, but the pressure on the rollers is heavier than the tread of any loco motive.

In the account of J. M. Speer, Sr., & Sons' wooden railroad (April 1st), the rails are white oak, and acted just as they did here.

On the Clifton Railroad, I understand they are principally maple. This wood is not so durable as oak in resisting decay, but wears far better under a wheel. The reputation which the Clifton road bears here among those best acquainted with it, and uninterested in it, seems to be quite similar to that of Messrs. Speer with theirs, so far as its permanent value is considered.

G. W. PEARSONS.

Ogdensburg, N.Y.

What Women Want.

MESSRS. EDITORS:—I saw some remarks in a late number of your paper about the probability of finding a cheap power, available for the ordinary purposes of every neighborhood. With your permission, I will say a few words regarding some wants of women which, it seems to me, might be served by it. I believe one reason why the lot of the majority of women has not been more alleviated by invention, is that their requirements are not fully understood. That dumb, pathetic patience, with which the household workers toil and wear out, leaves men in the dark as to how to help them. I have had occasion to think a good deal about their necessities, and will explain what seems to me to be the fittest means of satisfying an important one.

I believe few things could be desired which would so much relieve this class of women, as a cheap laundry in every neighborhood. I have long pondered about this, but the want of cheap power seemed to render the accomplishment of such an object impossible. Washing machines for every home do not meet their difficulty, for it is constant work and consequent want of time, and not alone heavy work and want of strength, which needs to be relieved. I do not mean to say washing by hand is not hard labor; but this cannot be relieved by mere mechanical devices without losing in time. Nor could the employment of some other than human force settle the difficulty, since there would be still a mental and physical strain of constant attention.

The care of a household, with its cooking, house cleaning, washing, ironing, sewing, and mending, brings conflicting claims of duty. They harass a woman, because all must be, to some extent, neglected, and no one of the number seems

to admit it. Thus the exertion is long continued, the care very great, and this wear and tear breaks down the nervous system, a woman's most sensitive part.

Thus, women need to have their work divided, and done in part by others. It may perhaps be thought that my description of the trouble shows the want of servants. But there can, in the very nature of things, be but a very small minority of the sex who can be thus aided. Wherever the very great majority of women do not marry, there is an artificial state of matters. For my part, I think that the want of good servants, which becomes greater and greater every year, as civilization is diffused, is owing to natural causes, and shows that we must make some other provision to lessen household labors.

If women who have families, could get garments made (leaving them no sewing but the mending); if they could have all the washing done, and that part of the ironing (a good deal) which could be done by machinery; the work which would be left, would neither wear them out nor render mental improvement or enjoyment impossible. It could rarely be very heavy, except in cases where there would be more than one woman in a family to do it.

I am satisfied the sewing could be go rid of, though it is foreign to the present subject to say how.

I suppose two things are needed to make real this fine project of mine for disposing of washing. The first is to obtain cheap power in every neighborhood; and, I presume, if wind could cheaply be made to store up compressed air, thus changing a variable to a constant force, it would be accomplished. The other requirement is machinery so cheap that somebody, in every country neighborhood, would be able to purchase and make a living by it. Perhaps it may sound Utopian to say this, but if clothes could be washed, dried, and ironed (so far as machinery could be made to do this) for twelve and a half or even twenty-five cents a dozen, it would confer a boon on women a million times greater than the ballot.

I suppose most inventors think mainly of the money they may make, and it may be considered a waste of words to speak of blessings to humanity. But in the old-fashioned time and place in which I was raised, money made without a benefit of equal value to the community from which it was obtained, was regarded as a not very honorable possession. As I have never given up this opinion, I refuse to think that honor is dead among others, and I hope there are some inventors who will be influenced, not merely by the prospect of gain, but by the hope of benefitting the sex to which their mothers belonged.

BETSY.

Need for Long Lamp Wicks.

MESSRS. EDITORS:—In the number for April 8th, E. W. B. disputes the need for wicks longer than those at present sold by American manufacturers.

For some years I have imported, for my own use, English wicks, which are put up in rolls of one dozen yards. Beside the economy, the mess and trouble of changing a wick is reduced to a minimum.

Should any American manufacturer, who makes a good article, try the plan of selling in rolls, I have no doubt it would either largely increase his business, or compel other makers to adopt the same system.

I know of only two American manufacturers who make really good wicks, but in reference to the English, I can say that the last, of a yard length, burns as well as the first.

CANADENSIS.

Standard Sizes for Rails.

Mr. Bessemer, in his inaugural address as President of the Iron and Steel Institute, makes the following remarks on standard sizes for railway iron:

"In the early days of our railway system, the great Stephenson and his compeers had to feel their way gently in the new career they were pursuing; their engines were mere toys compared with those we now employ, and the loads they drew were small in proportion. It was, therefore, only necessary that they should employ a rail suitable to the traffic of the lines as then worked; but as the railway system began to develop itself, and new lines were opened, the necessity for heavier engines and greater traffic became apparent to the engineers by whom they were designed. Nor was the mere addition of size the only point studied; different modes of laying down the rail were proposed, and were canvassed with great interest. Stone blocks gave way to cross wood sleepers, and these again had their rivals in longitudinal sleepers, and with them came the bridge rail, and the Vignoles rail, and the double-headed rail now commonly in use. Nothing could be more natural than the way in which the profession thus glided imperceptibly into the adoption of rails, of almost every imaginable variety of form and size, nor can any one be blamed for a result almost inevitable under the circumstances.

"But it is now evident that there is no need in practice for this infinite variety of size and form; we know pretty accurately what is the general average traffic on a line, and the weight of our engines. The work which a rail has to perform is so perfectly simple, and so clearly defined, that there cannot at the present day be any difficulty in establishing a standard rail suitable for all purposes.

"Thus, suppose we take the double-headed and the Vignoles rail, as representing the two classes of rails suitable for longitudinal or cross sleepers; and if we make a heavy, medium, and light one, of each of these types of rail, we should have a choice of six sizes, that would supply all the reasonable demands of our present railway system. Taking these three standard sizes of iron rails, of each class, I would then make three other standards of steel rails, in which the table or wearing surface was identical in each case with the iron standard, but so reduced in weight per yard as to reduce its power to resist a blow, or to sustain a weight precisely equal to the iron standard; so that in all cases the iron *a b c* rails and the steel *a b c* rails should possess the same powers of resistance to a heavy load, or a sudden concussion. We should thus diminish the great apparent difference in price between the iron and steel rail, for it must be remembered that the price per mile, and not the price per tun, is the real test of the cost of rails. The adoption of a standard rail would afford great facilities to the manufacture, by diminishing his stock of rolls, and allowing him to manufacture in slack times, and to supply any sudden demands from stock. It would lessen the cost of production, and afford the general advantages, to the consumer and producer, which have hitherto resulted, in all cases, from the adoption of universal or standard measures. It is difficult to imagine the state of utter confusion that would have reigned throughout our whole railway system, had the gage differed on every rail to the same extent as the rails. The one instance afforded by the broad gage is sufficient to convince us of the immense disadvantages that would have resulted from such an error, and, I doubt not that, should we happily arrive at an universal *a b c* standard for rails, we shall in the future look back with dismay at our present chaotic state."

Earths and Alkalies used in Pottery, etc.

White American bolus is bright, white, compact, very smooth and soft, not coloring, burns very hard, and at last forms a whitish glass.

Pearl white: light, smooth, not unctuous nor coloring; burns to a very pale yellowish white.

Tobacco-pipe clay: smooth, unctuous, slightly coloring, but is rather hard and very white; used principally to make tobacco pipes and white stone wares.

White lumber stone is used to take stains of grease out of woolen cloth.

Soap rock or Spanish chalk is white, firm, compact, weighty, hard, smooth, unctuous, not coloring; writes upon glass, and, if rubbed off, the marks become again visible by breathing upon the place, and, therefore, very useful in painting on glass, the engraving being afterwards hardened by fire, and, therefore, preferable for staining by fluoric acid.

Kaolin or porcelain clay is dry, friable, unfusible; that of Cornwall is used to make English china and fine pottery; that of Limoges, to make Sèvres china, and is exported to most all countries of the globe. In earlier and the present times, similarly famous for their beautiful gilding and paintings, these articles are made in the manufactures of Meissen, and at Berlin and Passau, to make china for Saxony, Prussia, and Austria.

White chalk is white, soft, will mark linen when newly burned; it grows hot with water, and falls into powder, and is then made into crayons for painters.

Terra cimolia is white, compact, smooth, coloring, burning rather harder, found in the island Argentière; it is used to wash clothes.

Hard chalk is coarse.

Spanish white, *blanc d'espagne, blanc de troyes*, are made from soft chalks by washing and making into large balls for cheap white painting, and covering papers, cards, etc.

Prepared chalk is made by precipitation from a solution of muriate of lime by a solution of sub-carbonate of soda in water, and washing the sediment.

Magnesia is white, and is obtained by precipitating the bittern or liquor left in the boiling of sea water, after the common salt has been separated, by a lye of wood ashes or subcarbonate of potash.

Sub-carbonate of magnesia is made up while drying into large cubes, the edges beveled; is powdered by being rubbed through a sieve.

Gelatinous alumine, hydrate of alumine, or pure alumine, not dried, but in a moist state, is used to mix cobalt in an oxidised condition, and other oxides, as a basis for the color.

Baum's white of alum: Roman alum, one pound, honey, one half pound, calcined in a shallow dish to whiteness.

Blanc de Bougival or gera earth is silvery, silky, white, very fine and glossy if rolled with a glass roller; used to make enamel surfaces on paper or cardboard; is effervescent with acids, and used as well as fine whiting.—*Professor Dembinsky, in the Mechanics' Magazine.*

Preservation of Meat.

Dr. Baudet, of France, has given details of a variety of experiments by him, made with solutions of carbolic acid, or, as some term it, phenic acid, in the preservation of meats. As the results of the experiments of one process, the acid used in aqueous solutions, he says:

I conclude that phenicated water, in the proportion of from $\frac{1}{1000}$ to even $\frac{5}{10000}$, might be applied to keep raw meat fresh and sweet, without imparting to it either any perceptible smell or taste, provided the meat be kept in well closed vessels, be they casks, tinned iron canisters or other vessels.

Second process; By means of vegetable charcoal, coarsely broken up, and saturated with phenicated water, at from $\frac{5}{10000}$ to $\frac{1}{1000}$. This process is applied as follows: I cover the meat with a thin woven fabric, in order to avoid its direct contact with the charcoal, which might penetrate into the fiber of the meat, which is placed next into barrels, care being taken to place therein first a layer of the phenicated charcoal, then a layer of meat, and so on alternately, until the barrel is quite filled, and all interstices properly taken up by the charcoal.

As regards the importation of raw meat, preserved by this means, from South America, I would suggest that the meat, first covered with any thinly woven fabric, be placed in bags made of raw caoutchouc, very abundantly obtainable in the country alluded to; so that the importation of raw meat and the importation of caoutchouc might go, as it were, hand in hand.

The mode of filling in alternate layers of phenicated charcoal and meat would, of course, remain the same; and there would be no difficulty in hermetically sealing up bags made of caoutchouc, either by soldering the seams together, or by placing a cap of caoutchouc over the mouth of the bag, and soldering the cap on hermetically.

Dangerous Burning-Fluid.

It would appear to be the duty of every scientific journal to utter a note of warning against the dangerous burning oils with which our country may be said to be literally flooded. The number of accidents arising from the use of adulterated oils is so great that many life insurance companies are disposed to charge higher rates where petroleum is employed in the family of the assured. The community is always deeply shocked at a murder or railroad accident, and a thorough examination is at once held by the coroner; but the burning to death of whole families, the immense destruction of property from fires occasioned by adulterated and dangerous oils, make no more than a passing impression. There appears to be no doubt that the number of deaths from this cause is far greater than from railroad accidents; and the sooner the most stringent measures are adopted to guard the community against the repetition of such calamities, the better for all concerned. We desire to call attention to the mountebanks who travel around the country to exhibit their non-explosive oils. They show that it is impossible to explode their particular brand, and they give as a reason that it has been treated with certain chemicals in a way to remove all danger. The oil, they say, has been "carburetted" or "carbonized," "ozonized," "oxygenized," and is no longer liable to explosion. They put some of the fluid in a can and set fire to it, and sit down on the can. They perform as many tricks as the most experienced master of legerdemain, and perfectly silence unscientific listeners. These men are one and all, impostors, and if you live in the country, call in the hired man and turn them out of doors; if you reside in the city, call in the police and enter a complaint against them then and there, and have free lodgings provided for them in the station house. Nobody pretends that naphtha, alcohol, ether and the like are explosive. They can be lighted and burned quietly and in the most inoffensive manner. It is only when mixed with the oxygen of the air that an explosive compound is produced, and this part of the experiment is naturally omitted by the exhibitor. It requires considerable skill to prepare just the right mixture of light oils and air to insure success, and it is under cover of this difficulty that the dealers in adulterated oils escape detection. Unfortunately, just the proper mixture is sometimes formed in lamps as the oil is exhausted, and the fatal explosion takes place. The number of accidents from the bursting of lamps is very small, and it is not the question of explosion that should attract the most attention. By far the greater number of deaths and losses by fire have arisen from the ignition of the lamps or cans, either from the breaking of a lamp or some careless handling of the petroleum—the ignited fluid spreading over the clothing of the person or on the floor is what does the damage. It ought to be understood that there is no chemical that will make an oil safe; the patents and claims on this subject are sheer impositions. The only way to make an oil safe is by distillation, that is, removing from it all oil or naptha that will take fire below 110° F. Any oil that can be lighted on its surface by a match and will continue to burn without a wick, is unsafe. Sperm oil, rape seed oil, and the refined petroleum can be poured upon the floor and a match applied, but they will not burn; it is necessary to heat them to a high point before any vapor will come off that will take fire from a taper and continue to burn. Any oil that, when poured into a saucer, will take fire from a match and continue to burn, as alcohol does, is unsafe, and ought to be discarded at once. Such an oil contains volatile compounds which can give rise to explosive vapors, and if the lamp breaks, may occasion the most dangerous burns. We must therefore warn all persons from using such oils about the premises.

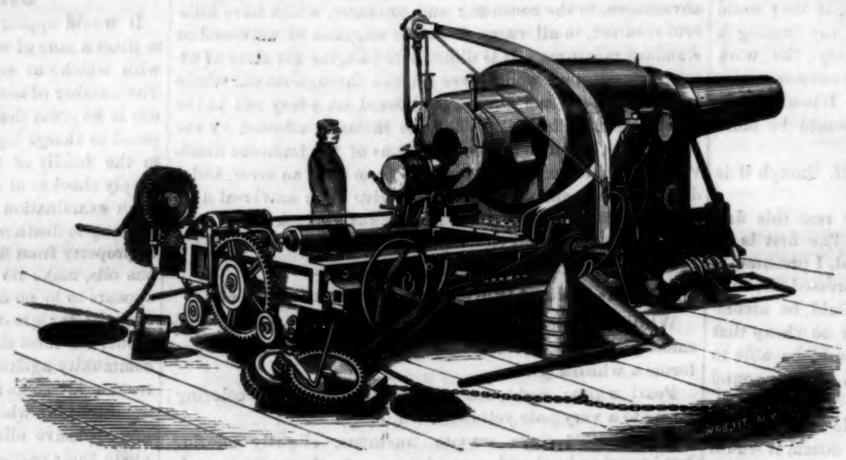
There is another danger to which we wish to call attention and that is the use of cheap fluids in the so called vapor stoves. Next to the use of gunpowder for heating purposes, we know of few things so dangerous as these inventions. Their very utility is founded on the conversion of the oils into a vapor so that it can be readily ignited, and afterwards the heat of combustion keeps up the supply of gas. The persons who use these contrivances first manufacture a vapor that, when mixed with air, is fearfully explosive, and then in defiance of fate, they put a light to it, and ought to be thankful that the whole apparatus is not blown to atoms. The inventors of these infernal machines are fully aware of the danger, and hence the long list of precautions that accompanies each package; all of the directions are intended to guard against the formation of the explosive mixture of air and vapor mentioned at the outset of our article. The skill required to manipulate such contrivances is of the highest character. We have used them in laboratories to produce a powerful gas jet for many years, but never allowed any but experienced assistants to attend them. In inexperienced hands or where the greatest care is not constantly exercised, they should never be used. We repeat, trust none of the so called non-explosive oils or patent contrivances to burn them.—*Journal of Applied Chemistry.*

Krupp's Cast-steel Breech-loading Rifled Guns.

The superiority of cast steel over every other material used for guns is now an acknowledged fact, and its general adoption may be regarded as merely a matter of time. The Krupp system of breech-loading steel guns is now used by many of the European governments with much success, and to the wonderful accuracy of range and great penetrating power of these guns may be attributed, in a large measure, the recent victories of the German armies whenever their artillery was used. They are manufactured at Fried. Krupp's great establishment, at Essen, Prussia. An interesting description of these works was published some time ago in the SCIENTIFIC AMERICAN. About two thousand steel guns have, so far, been turned out.

The largest Krupp guns used at the siege of Paris were 24-pounders, or, as they are now called, fifteen centimetres (about six inches). The weight of this gun is about six thousand pounds; charge of powder, four and a half to five and a half pounds; weight of projectile, fifty-five to sixty pounds. The French forts were armed with the largest marine guns of the French fleet, but the accuracy of the 24-pounders soon dismounted them, piercing the casemates and reducing Fort d'Issy to a heap of ruins. During the entire siege operations, as well as in the artillery fights, the loss of the Germans was insignificant.

Our engraving is a view of one of Krupp's eleven-inch, breech-loading steel guns, with self-acting casemate carriages, showing also the mode of charging the gun. An illustration of a fourteen-inch gun, of somewhat similar form, carrying a projectile weighing 1,000 lbs., was published in our paper of Oct. 1, 1870.



KRUPP'S CAST-STEEL BREECH-LOADING RIFLED GUNS.

COMPARATIVE VALUE OF VARIOUS GUNS.

	Weight of gun.	Weight of projectile.	Weight of charge of powder.	Foot-tuns per square inch of section of projectile.
	lbs.	lbs.	lbs.	
24-pounder siege artillery	6,000	55 to 60	4½ to 5½	
" " marine hooped gun..........	8,000	77	15	47·70
11-inch Krupp gun..........	55,000	495	25	74·70
15 " Rodman gun..........	30,000	460	60 to 100	26· to 43·

The above table shows that the penetrating power of a 15-inch Rodman gun, weighing 30,000 lbs., with 60 lbs. of powder, is equal to 26·80 foot-tuns, and with 100 lbs. of powder, equal to 43 foot-tuns, while the 24-pounder Krupp gun, weighing only 8,000 lbs., and with only 15 lbs. of powder, is equal to 47·70 foot-tuns. A ship armed with this light weapon would be more than a match for any vessel with as many 15-inch guns on board as she could carry.

In view of these facts the quicker our government removes the smooth bore Rodman guns from its forts and vessels, the better. It is evident they are good for little except old iron.

The latest competitive trial of steel guns took place on the Steinfeld, at Vienna, in October, 1870, between a Krupp 9 in. breech loading gun and a 9 in. Armstrong muzzle loader.

After 111 rounds (with prismatic powder), the Armstrong gun showed a split 26 inches in length, and was declared to be completely unfit for service.

The Krupp gun fired in the same time 210 rounds—the gun and the breech loading apparatus being pronounced perfect at the close of the trial.

The greatest number of rounds, fired from one of the 11 in. Krupp guns, on record at the works, is about 600, but some of them have, no doubt, fired a much larger number.

The 14 in. guns (50 tuns) were tested two years ago by 18 rounds each, with projectiles of 1100 lbs. and 150 lbs. of powder.

Thos. Prosser & Son, 15 Gold street, New York, are the American agents.

Workmen's Houses.

It is so repugnant to the feelings of an Englishman, says the *Scientific Review*, to be compelled to dwell with several families in one house, that every endeavor to provide cottage accommodation for workmen, who have naturally but a limited amount to dispose of for rent, should receive the utmost possible encouragement; more especially as, from the smaller amount of profit attending the construction of cheap houses, there is less inducement for architects and builders to give their attention to that class of dwelling. To meet, therefore, the wants of workmen, whether artisans or clerks, Mr. John P. Harper, M. E., of Derby, has prepared an admirable series of plans for workmen's houses and semi-detached cottages, which can be so cheaply erected as to permit of their being let at a merely nominal rental, although affording all the comfort and convenience that need be desired.

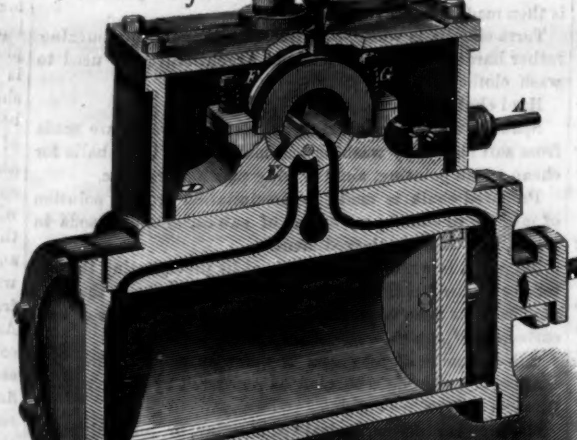
The hollow brick wall is that which Mr. Harper advocates, and as by this means one third of the bricks otherwise necessary are saved, its advantages will be obvious. The hollow walls, moreover, are quite as substantial and durable as solid walls of equal thickness. As in this system of building there is always an air jacket between the inner and outer portions of the walls, the damp cannot enter the rooms, so that the houses are rendered drier, warmer in winter, and cooler in summer. The advantage of the hollow wall system may be judged of from the fact that some of the houses built in dry weather upon that system, by Mr. Harper, have been inhabited before quite completed, without injury to the occupants. As the design of the houses, and the amount of the accommodation given, must, of course, be dependent upon the amount of money that can be expended upon them he has prepared several sets of plans to meet the various requirements, care being taken in all cases to give a moderate-sized living room, and ample bed room accommodation.

In the plan, which seems to have secured the greatest amount of approbation—for Mr. Harper has built a considerable number of houses upon it, and the tenants have always expressed themselves highly satisfied with the arrangements and accommodations afforded—he has given an excellent living room, or kitchen, 15 ft. by 14 ft. 2 in., with a small space (about 8 ft. by 3 ft.) taken out at one corner for stairs and cupboard; a parlor 11 ft. by 9 ft.; and a good cellar pantry 9 ft. by 3 ft. 7 in.; while on the upper floor are three moderate-sized bed rooms—one with a good fireplace in it. The privies, ash pits, and coal stores, are at a distance from the houses, so that their healthfulness is insured. When built in blocks of not less than twelve, these houses can be erected at the rate of £78 each (exclusive of drains), and a small scullery, or wash house, can be added at very little cost. The design appears very good, and is calculated to give good and efficient ventilation in every room.

SEIFERT'S BALANCED STEAM VALVE.

The soul of a steam engine, if we may be allowed such an expression, is in its valve gear. It is this, principally, that gives an engine its individuality, and upon it, more than on anything else, depends the economy with which a steam motor performs its work.

Fig 1



Many have been the devices by which it has been sought to relieve steam valves from the pressure on their faces.

Fig. 2

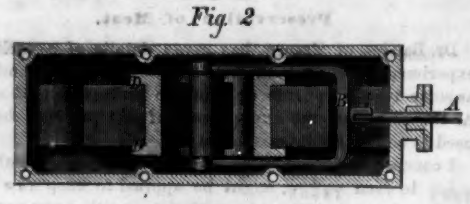
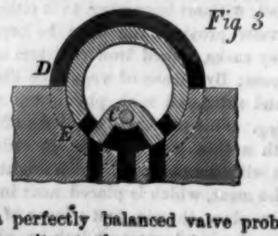


Fig 3



To say that a perfectly balanced valve probably does not exist, is only to reiterate the story of man's constant failure to attain to his ideal, whether in mechanics, art, or morals But although imperfections cannot be wholly eliminated from this class of devices, any more than from anything else man can contrive, a degree of perfection may be, and has been obtained, sufficient to greatly lessen the loss of power expended in overcoming valve friction.

Our engraving shows another competitor in this field, designed primarily for use on locomotives, but adapted to any kind of engine, which, while it is claimed to be as perfectly balanced as others in use, offers advantages not possessed by them.

The valve is cylindrical, and fitted to seat on all sides The steam is admitted through the center of the valve, and pressing equally in all directions, does not press the valve more in one direction than in the opposite direction, so long as the fitting remains steam tight.

Fig. 1 is a vertical and longitudinal section through cylinder, steam chest, and valve. Fig. 2 is a plan view of the valve and its attachments, and Fig. 3 is a sectional elevation of the valve, with a portion of the seat. The valve stem, A, Fig. 2, is pivoted to a yoke, B, which in turn is pivoted to the valve at the lower side, as shown at C, Fig. 3.

On each side of the valve is formed a rim or flange, D, Figs. 2 and 3, which fits steam tight against the sides of the valve seat, E, Figs. 1 and 3, and also tight against the sides of a cap, F. This cap, F, is held down to its place by studs and coiled springs, shown at G, Fig. 1. This allows the valve to rise when the motion of the engine is reversed, or when it is running without steam.

The valve, being simply a slide valve running upon an interior cylindrical surface, retains all the properties of the ordinary slide valve, with this additional characteristic, that, moving on a central axis, which is the geometrical axis of the cylindrical surface of the valve, it has a quicker motion, giving more rapid admission of steam, sharper cut-off, and freer exhaust.

Besides these advantages, it is claimed that it can be made at a cost little exceeding that of the plain slide valve When the engine works water, all sediment tends to run down and escape at the exhaust, instead of spreading over the seat and cutting the surfaces of both valve and seat. The valve can be applied to any engine in use, the new seat being placed over the old one without any injury to the latter. The seat of the valve, except, at most, the areas of the two ports, being always covered, it is not so liable as the old style of valve seat to be injured by rust, when the engine stands unused. In case the yoke should break, it will drop at once down, out of the way of blows from the return stroke of the valve stem, which obviates the breakage of parts in the steam chest under such circumstances. If the valve itself should break, which sometimes occurs, none of the broken parts can get out of place or wedge in the ports, and thus give rise to extensive breakage, as would be the case with the plain slide valve.

It is claimed that on engines with heavy fly wheels, and upon which the demand for power is very unequal, as with those used for driving rolling mills, etc., the quick motion of this valve will act as a controller of speed, enabling the engine to accommodate itself to the work to be performed.

The valve is lubricated by means of a cup with tubes leading down over the cap, as shown in Fig. 1; and it retains oil better than a plane surface.

Patented, through the Scientific American Patent Agency, March 28, 1871, by Seifert and Kane.

Address for rights or license to use, Mr. T. Kane, 222 East Fifty-second street, New York city.

The Star Sirius.

Many things combine to render this brilliant star an object of profound interest. Who can gaze on its pure silvery radiance, and reflect how many ages it has adorned the heavenly dome with its peerless lustre, and how many generations of mankind have rejoiced in it—and among them all the wise and the good and the great of history,—without awe, and admiration!

In ancient Egypt, it was an object of idolatrous interest. It was then of a brilliant red color, but is now a lustrous white; and the cause of this change of color, as well as the nature and period of the revolution it denotes in the star itself, are wholly unknown. Its distance from our earth is not less than 1,300,000 times our distance from the sun; and its light must travel twenty-two years to reach us! Another circumstance of deep interest connected with it is, that it has changed its position, during the life of the human family, by about the apparent diameter of the moon; and that astronomers, detecting some irregularities in its motion, have been convinced that it had a companion star—which they thought to be non-luminous, since their telescopes could not detect it. But Mr. Clark, with his new and powerful achromatic telescope, has found this neighbor of Sirius, hitherto invisible, and verified the conclusions to which astronomers had been led by reasoning on the facts they had ascertained.

HOW TO PRESERVE EGGS.—Apply with a brush a solution of gum-arabic to the shells, or immerse the eggs therein; let them dry, and afterwards pack them in dry charcoal dust. This prevents their being affected by any alterations of temperature.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. A. E. BEACH.

"The American News Co.," Agents, 121 Nassau street, New York.
"The New York News Co.," 8 Spruce street, New York.
Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet

VOL. XXIV., NO. 19 . . . [NEW SERIES.] *Twenty-sixth Year*

NEW YORK, SATURDAY, MAY 6, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

Anthraflavic Acid.......298
Answers to Correspondents.......298
Are Noisome Effluvia Injurious to Health?.......298
Artesian Well in Lousiana.......298
*Bartlett & Boomer's Extension Hemmer.......297
Business and Personal.......298
Carotine.......290
Coal in Wyoming Territory.......297
*Combined Blotter, Ruler, etc.......291
*Combined Milk Pail and Strainer.......291
Composition of Meteors.......297
Compound Engines.......295
*Crampton's Apparatus for Burning Coal Dust.......290
Dangerous Burning Fluids.......298
Early Railroading.......292
Earths and Alkalies used in Pottery.......293
Explosion of a Cylinder for Drying Cotton.......291
Fresco Painting.......297
Heliographic Printing.......297
How to Build a Chimney.......292
Improvement in Lead Furnaces.......289
*Improved Wheat Steamer and Dryer.......287
Inspection of Steam Boilers.......295
Interesting Experiments on Color.......289
Inventions Patented in England by Americans.......299
*Krupp's Cast Steel Breech-loading Guns.......294
Manufacture of Chlorine.......298
Manufacture of Wire.......297
Mixture for Gilding.......298
More Humorous than Scientific.......296
*Mussel Climbing.......291
Need for Long Lamp Wicks.......298
New Books and Publications.......298
New Telegraphic Instrument.......297
Official List of Patents.......299
One Hundred Thousand Dollars Reward.......298, 295
Poisonous Fertilizers.......292
Preservation of Meat.......293
Prevention of Rust.......298
Queries.......299
Recent American and Foreign Patents.......299
*Seifert's Balanced Steam Valve.......294
Simplicity in Design.......292
Standard Sizes for Rails.......295
Testing Plated Metal.......289
*The Cotton Worm.......290
The Firing of Gunpowder in Closed Chambers.......297
The Hartford Steam Boiler Inspection and Insurance Co.......297
The New York and Brooklyn Suspension Bridge.......297
The Planet Mercury.......297
The Star "Sirius".......294
The Use of the Jar in Boring for Oil.......293
The Wofe Rock Light House.......288
The World in the Ceiling.......290
Uncommon Food.......289
Value of the Self-acting Mule.......291
Vital Electricity.......298
What Women Want.......293
Wooden Railways.......292
Workmen's Houses.......294
Wrought Iron Railway Sleepers.......291

COMPOUND ENGINES.

The idea of exhausting from one cylinder of a steam engine into another, and there utilizing the expansive force remaining in the steam after it has done its work in the first cylinder, is not by any means new. The history of the earlier attempts in this direction is so familiar to engineers that a review of it would be trite. Of late, however, this idea has been revived, and we are now in the midst of a compound engine mania.

A certain class of engineers seem to think that there is some peculiar law which works in a compound engine, by which a large gain in economy can be made. That great gain has been made by the substitution of compound engines for single cylinders, in certain cases, cannot be denied. That this gain is inherent in the compound system *per se* is denied by able engineers. The use of steam expansively, if the expansion be carried to its economical limit, will always show great gain over steam used non-expansively, or imperfectly expanded. Whether the substitution of compound engines for single cylinder engines has accomplished more than would have been done by single cylinders so constructed as to admit of expansion to the same extent, is a question open to debate. A given volume of steam, at a given temperature and pressure, has in it the capacity for the performance of a given amount of work, which theoretical amount of work can never be exceeded by the use of any appliance whatever.

If compound engines can be proved to work steam nearer up to its theoretical limit than single ones can do, their value will be established. It is not established, however, by the comparison of compound engines with single ones confessedly inferior to other single ones. A gain in economy must be clearly traceable to the system as a system, and not only traceable to it, but capable of being explained on rational principles, before it can be accepted as a scientific fact. If there be any such gain, it neither depends upon any occult cause, nor results from anything other than the operation of well known laws of heat and steam.

With the same initial pressure and the same expansion, waiving the effects of friction, radiation, and clearance, the same results would be obtained by engines of either class; but the disadvantages of clearance, radiation, and friction are increased in compound engines, and hence there must be some good reasons for their use, which compensate for these disadvantages.

These reasons may be briefly stated. Improvements in surface condensers enable marine boilers to carry much purer water than they could do formerly; and hence they can carry higher steam. With higher steam, the principle of expansion has become more economically available. Marine engines are for the most part, direct acting, using slide valves with which steam can not be cut off so as to expand in single cylinders to the extent desired. To effect this expansion without the use of an independent cut-off, the compound engine is employed, and it may therefore be considered as a substitute for independent cut-off single engines, designed to produce the same result.

It is evident that in the compound engine, the expansion might be carried to its extreme economical limit, by the proper proportioning of the size of the large cylinder to that of the small one, were it not that some losses occur, alluded to above; a commonly great source of loss arising from the waste space or clearance between the two cylinders.

It is not, then, because any principle is employed in the compound engine, not involved in the action of other engines, that it is found good practice to use them for propelling ships, but simply because their use renders it possible to accomplish a result not otherwise attainable except by the use of complicated valve gear, and by relinquishing other features desirable to retain in marine engines.

For land engines, there is less to be said in their favor. We doubt that any result, not attainable by a good variable and independent cut-off, has ever been shown by them; while at the same time they are more cumbrous and expensive. There have been, however, some statements made in regard to a 150 horse-power compound engine—running at Yonkers, a short distance from New York on the Hudson river—which, if substantiated, will go far to modify our opinion. We have not seen this engine, but are told that it is compact in the extreme, and that it gives an economical result of less than two pounds of coal per horse power per hour.

There is no mistaking the fact that we have entered upon an era of compound engines. Not only are old vessels being refitted with such engines, but some of the best new steamers are supplied with them. The steamship *Oceanic*, recently described in our columns, has a fine specimen of this class of engine, finished in a style worthy of that magnificent craft. A well-known engineer of this city is superintending the construction of several for the United States Navy, while abroad they seem to meet universal favor.

INSPECTION OF STEAM BOILERS.

We are in receipt of the second annual report of Mr. T. J. Lovegrove, Inspector of Steam Engines and Boilers, Philadelphia, Pa., which states that, during the year 1870, only two persons in the department have been injured by steam; one slightly scratched by the explosion of one of the sections of a Harrison boiler; and another scalded by the explosion of another boiler, but only so as to be confined to his residence for two weeks.

It is claimed that the immunity from disastrous explosions in Philadelphia, when contrasted with the large number that occurred during the same year in various parts of the United States, is evidence of the efficiency and utility of boiler inspection in that city.

If proper systems of inspection can be secured, there can be no doubt that steam boiler explosions would become so rare that the dangers attending the use of steam would be reduced to scarcely more than attend the use of water power. The difficulty lies in the selection of inflexible and thoroughly qualified officers, who know enough to perform their duties, and who will not, for any consideration, neglect them. Laws are easily framed, but it is not always easy to obtain their faithful execution.

The inspector regards as safe the class of boilers known as "sectional," which comprises numerous devices of tubes, globes connected by tubes, etc., in which the water is contained, and heated by the external application of the gases of combustion. He thinks such boilers might be properly exempted from inspection.

The increasing use of steam is shown by the fact that 31 new boilers have been put into use in Philadelphia during the year, while 27 old ones have been repaired and re-created, making a total of 58 more than were inspected the previous year, and which will furnish power to establishments employing in all 3,500 operatives.

During the previous year, so large a number of boilers were condemned that in the present year it has only been necessary to condemn one.

The inspector refers, in his report, to an editorial published in this journal (in our issue of April 23, 1870), upon Steam Boiler Inspection; in which we opposed a proposition said to have been made in Chicago, to vest the power of inspection wholly in a steam boiler insurance company. He thinks the other suggestions made in the article referred to would, if adopted in Philadelphia, prove advantageous to its interests. We felt certain, when writing the article in question, that we were reflecting the views of intelligent steam engineers and steam users throughout the country; and we trust that the remarks made on that occasion, in connection with others made before and since, will continue to aid in the efforts now making in different parts of the country to establish thorough systems of boiler inspection.

We also gather from this report, that the system of inspecting and licencing such men as are to have the charge and care of boilers, is working well, although we are surprised that there are so many reported as examined and licenced, considering the fact that there is no penalty attached to the employment, for this purpose, of men who have not passed such an examination, and who possess no licence. To be efficient, such examination should be made compulsory, under penalty for neglect. Without this, it will be little more than a farce.

The average qualifications of men who claim to be able to perform the duties of engine and boiler tenders, is shown by the fact that, out of 56 examined, only 4 were first class: 26 were second class, 22, third class, and 4, fourth class. Out of 39 renewals, only 9 were first class.

We are convinced that the inspection of boilers needs to be supplemented by the thorough examination of boiler tenders, before we can expect the full value of any system of inspection to be fully demonstrated. With good sound boilers, and men thoroughly qualified in all respects to use them, we should rarely hear of disastrous boiler explosions.

ONE HUNDRED THOUSAND DOLLARS REWARD FOR A NEW INVENTION FOR PROPELLING CANAL BOATS.

The Legislature of the State of New York, at its recent session, passed a bill offering a reward of one hundred thousand dollars for the best improvements for the propulsion of canal boats. This bill had not, at the time of our going to press, been signed by the Governor, but his prompt signature is expected, and thereupon it becomes a law. In another column, we publish the full text of the bill.

The reward offered is a handsome one, is not hampered by any obnoxious or narrow conditions, the terms of competition are broad and liberal, and the whole matter is highly creditable to the authorities. In nearly all other examples of public rewards for improvements, it has been made an imperative condition that the inventor should surrender his rights to the patent. In the present case, nothing of this kind is required, but the inventor will be entitled to the offered reward, and to all additional benefits that he may be able to derive from his patents.

These liberal and judicious terms will have a tendency to stimulate the inventive geniuses of our country; and, that some of them will succeed in studying out good and practicable plans, meeting every requirement of the case, we cannot for a moment doubt.

The Commissioners, who are to decide upon the merits of the various plans, embrace some of our most honored and able citizens. Gen. George B. McClellan, of New York city Chief Engineer of the Department of Docks, 348 Broadway is to be chairman of the commission. Rules and regulations for the filing and examination of plans will doubtless be issued by the Commission, which we shall duly place before our readers.

The Commissioners, after examining the plans, will decide as to the best, and may issue in the aggregate three certificates. Should they issue but one certificate, the holder will receive fifty thousand dollars. If two certificates are issued, the holder of number one draws thirty-five thousand dollars, and number two, fifteen thousand. If three certificates are issued, number one draws thirty thousand dollars, number two, fifteen thousand, and number three, five thousand.

After this selection from the plans and payment of rewards, practical trials thereof upon the Erie Canal are to take place, and upon such trials, the Commissioners are to award the further sum of fifty thousand dollars, issuing three additional certificates, as before described, making the total sum of one hundred thousand dollars.

The improved navigation of the Erie Canal is a matter of momentous importance to the State of New York. Upon the economy and expedition with which produce can be transported through the canal depends the question, whether this State is to maintain its pre-eminence as the main highway for Western export and supply, and this city, its proud position as the emporium of shipping and commerce.

THE REMOVAL OF THE HELL GATE OBSTRUCTIONS.

Few who have not visited the scene of operations now in progress for the removal of the Hell Gate obstructions in the East river, have an adequate idea of the extent and difficulties of the undertaking. We have in progress an engraving illustrating the work, which will shortly be published, and we shall accompany it with more detailed description than we have yet given.

The rock which has to be removed in making the headings is a very hard trap rock, extremely difficult to drill. The drills used are the diamond drills of Severance & Holt, illustrated descriptions of several kinds of which have, at different times, appeared in this journal. The style of drill used in this work may be described as follows:

The boiler, a small upright, used extensively in mining work, is stationed in the shaft, and steam is driven through a two inch rubber pipe to the machine proper. This consists of a simple framework of iron, about seven feet high by three feet square, formed by four upright posts, with cross arms at top and bottom. A small double acting oscillating engine, with cylinder three by six inches, drives the rotary drill, which is a hollow tube, upon the end of which is secured a piece of steel somewhat less than two inches in diameter, called the "head." In the face of this head are set four rows of the carbons or black diamonds, three in each row, with four more in the outer circumference, one between each row, making sixteen diamonds in all. The setting of these stones is similar to the setting of a jewel in a finger ring. Although they are diamonds, the value is but a trifle compared with the more common yet less useful carbon bearing that name. The market price is from three to six dollars each.

A small force pump connected with the machine, and worked by it, forces water through the tube or drill, so that the surface upon which the diamonds act is always wet. This prevents the heating of the drill, and at the same time softens in a measure the surface of the stone. The drill is driven at a speed of about 400 revolutions in a minute, and is capable of drilling a two inch hole about six feet per hour,

or twenty-four feet each four hours. Three experienced miners will drill a hole of same dimensions three feet in the same time, showing that the machine, with its two attendants and one fireman, will do the work of eight men.

These diamond drills are being used very extensively in the marble and slate quarries of Vermont, and Severance & Holt are extensively engaged in making them. In addition to drilling single holes in the rock, they are used for channeling purposes—a number of drills being used intersecting the holes, so that a complete cutting is made.

MORE HUMOROUS THAN SCIENTIFIC.

The Chicago *Post* is to be congratulated upon having attached to its staff a writer of such rare gifts and acquirements as the gentleman who penned the article, "What shall we Eat?" and which we find floating about through our exchanges. Men who can dress up nonsense in so attractive and spicy a manner, are not numerous, and are a boon to the dailies who can secure their services.

First, he tells us that "when we pour milk into a cup of tea or coffee, the albumen of the milk and the tannin of the tea instantly unite and form leather, or minute flakes of the very same compound which is produced in the texture of the tanned hide, and which makes it leather, as distinguished from the original skin. In the course of a year, a tea drinker of average habits will have imbibed leather enough to make a pair of shoes, if it could be put into the proper shape for the purpose."

Now, we beg our readers and others who have laughed at the fun of this paragraph, and then grown sick at the thought of their stomachs being turned into tanyards, not to give themselves any uneasiness. The humor of this pleasant writer is far greater than his knowledge. It is gelatin, not albumen, that unites with tannin in the manufacture of leather, and gelatin does not exist in milk, unless it is put in by mistake or design.

Again, our funny scientific lecturer says: "A great many things go into the mouth. This is not an original remark. We have seen it somewhere. But it is an alarming fact. We drink, every one of us, a pair of boots a year. We carry iron enough in our blood constantly to make a horseshoe."

Smelting furnaces, as well as tanneries, are we called? Let us see. The average quantity of blood in persons weighing 140 lbs., is one fifth the entire weight—28 lbs., which contains, according to Lecanu, less than 0·002 of its weight of oxide of iron, or less than 0·64 of an ounce, of which less than three fourths, or less than half an ounce, is iron. What sized horses have they in Chicago that wear shoes weighing only half an ounce?

Again, we are told, that "we have clay in our frames enough to make, if properly separated and baked, a dozen of good-sized bricks."

Whereabouts is this clay located in the human system? The statement is, no doubt, based on facts peculiar to Chicago. One brick is about as much as a good-sized New Yorker can carry. Does our friend mean to intimate that people in Chicago can carry a dozen, and good-sized ones at that? Of course, when speaking of frames, he means hat frames, since clay does not enter as an ingredient into the animal economy. "We eat at least a peck of dirt a month—no, that is not too large an estimate." That *may* be true, but we don't think Chicago can beat New York in this particular, no matter how many bricks her citizens can, individually, stagger under. In the matter of dirt eaters, we do believe we have some champions that can beat the world; we will not do violence to their modesty by publicly naming them.

But we are not only charged with being tanneries, iron works, and brickyards, but with being hat factories. Says the scientist of the Chicago *Post*, "The man who carelessly tips a glass of lager into his stomach little reflects that he has begun the manufacture of hats, yet such is the case. The malt of the beer assimilates with the chyle and forms a sort of felt—the very same seen so often in hat factories. But not being instantly utilized, it is lost."

Cannot some inventor make his fortune by inventing a process for saving this felt made, not of lager and chyle, but out of the wool extracted from a Chicago editor's eyes? Certainly his acquaintance with lager is limited, or he does not know chyle.

But we are "marble yards" as well. He goes on to say: "It is estimated that the bones in every adult person require to be fed with lime enough to make a marble mantel every eight months."

This is good, when it is considered in connection with the fact that a dried human body weighs from fourteen to twenty pounds altogether—bones, muscles, and viscera.

Finally, our Chicago physiologist sums up;

"The following astounding aggregate of articles charged to account of physiology, to keep every poor shack on his feet for threescore years and ten:

Men's shoes, 70 years, at 1 pair a year........	70 pairs.
Horseshoes, 70 years, 1 a month, as our arterial system renews its blood every new moon.	840 shoes.
Bricks, at 12 per 7 years....................	120 bricks.
Hats, not less than 14 a year..................	980 hats.
Mantels, at 1½ a year.........................	150 mantels.

Here we are surprised to observe that we eat as many shoes as we wear, and a sufficient number of hats to supply a large family of boys; that we float in our blood vessels horseshoes enough to keep a span of grays shod all the while; that we carry in our animated clay, bricks enough to build a modern fireplace, and in our bones marble enough to supply all our neighbors with mantels. We have not figured on the soil, at the rate of a peck a month; but it is safe to say that the real estate that a hearty eater masticates and swallows in the course of a long and eventful career would amount to something worth having, if sold like the corner lots on State street, at $2,000 a front foot."

In this summary the horseshoes, bricks, hats, and mantels are multiplied in a manner that shows its compiler to be just the right man in the right place. Let him alone for making mountains of molehills. Clearly the Chicago *Post* never need be at a loss for something sensational so long as it keeps to itself this astonishing computer, and sees to it that he keeps an ample supply of bricks in his hat.

ARE NOISOME EFFLUVIA INJURIOUS TO HEALTH?

In the last number of the New York *Medical Journal* appears an article from the pen of Wm. C. Roberts, M.D., Vice-President of the New York Academy of Medicine, in which he discusses at length the effect of what he styles "non-specific emanations," on the public health.

In this article, Dr. Roberts refers to a paper read by him some years ago before the New York Academy of Medicine, in which he took the ground that "noisome smells, effluvia, or fetid emanations were not necessarily and in all cases injurious to the health of individuals or communities." In that paper, the author maintained that the importance of such emanations as sources of disease had been overrated; that only under certain circumstances were such odors and exhalations pestilential, and that when non-specific, that is, when not proceeding from matters containing the infection or contagion of specific diseases, such as small-pox, etc., they were, for the most part, innocuous.

In the article under consideration, he admits that, in certain idiosyncrasies, such emanations do occasionally cause a train of disorders, acting partly through the brain and nervous system, and partly through the blood. Among these disorders are enumerated diarrhœa, cholera morbus, dysentery, and typhoid fever.

Dr. Roberts, however, after making these admissions, thinks them of little effect as bearing upon the point at issue—the effect of bad odors upon the general health—and goes on to state, that, in the filthiest and most fetid streets of New York, where the air "reeks with tainted odors of slaughter houses, etc.," the inhabitants do not suffer more than those in cleaner localities; that persons engaged in offensive manufactures enjoy good health; that while, not long ago, small pox prevailed extensively in the city, a certain locality, which, according to his statement, was in too disgusting a condition for description, did not show any special susceptibility to the endemic.

In support of this view, he also cites facts stated and assertions made in a discussion of this question before the British Association, at its annual meeting at Bath, England, in 1864. Some of these facts and assertions we will enumerate as briefly as possible.

The large quantity of sulphureted hydrogen emitted by the volcanoes near Naples does not render that city more susceptible to typhoid fever than other cities. The hospitals of that city are dirty and noisome, yet this condition of affairs does not cause fever. The worst fevers prevail endemically where there are no bad smells. Carbureted hydrogen, which has no smell, is as injurious to health as sulphureted hydrogen, which has a most disgusting smell.

The smell of the water of Leith is offensive to such a degree that it is said "it will knock down the de'il," yet its banks are the healthiest part of the city.

Dr. Livingstone, the great African explorer, believes tha foul odors are not the cause of fevers in Africa. "He stopped with his suite all night at a place down the Nyanzi, where the water, as it came out of a marsh, was as black as ink, and had a most abominable smell, turning the paint on the ships white, etc. This phenomenon did not produce illness in the crews, nor was it known to do so among the natives. It would, he said, be a great mistake to suppose that fevers came from the presence of bad smells."

Dr. Kirk concurred in Dr. Livingstone's opinion. Dr. William Budd, who is distinguished for his researches into the causes and pathology of epidemics, believes that mere smells are innocuous. In 1858 and 1859, when the river Thames stank so grievously that the committee rooms of Parliament were only habitable through the use of deodorizers, and the law courts were broken up; and when the steamers lost their traffic, passengers going miles around to avoid even crossing the bridges, the health of London remained remarkably good. Fever, diarrhœa, and dysentery were even less than in 1857.

Thus much for Dr. Roberts' opinion, and the facts which support it. Before remarking upon them, we will mention a case in point, which adds to the strength of his argument. Gloversville, in central New York, produces annually a very large quantity of gloves, the leather for which is tanned in and about the village. There is in summer a constant smell pervading the air, resembling that of carrion, extremely offensive to those not accustomed to it. Yet the average health of the community is as good as that of other villages in the same county, exempt from this odor.

It is, in the opinion of Dr. Roberts and of other authorities cited, necessary to remove and disinfect the substances emitting foul smells, not because they are necessarily inimical to health, but because they *may* contain the germs of specific diseases; therefore, for the safety of the public, they should not merely be deodorized, but *disinfected* also.

While, in the main, agreeing with the opinions above set forth, and not disputing the alleged facts brought forward to support them, we still believe that foul odors, emanating from organic substances in a state of decay, even if free from contagion, do, through their debilitating effect, predispose or fit the human system for certain kinds of disease; so that, while there may be no greater number of cases in which such complaints originate, those who are attacked are less liable to resist the attacks, and recover more slowly.

It is also admitted by many, who do not believe specific diseases can be generated by foul smells *per se* that such smells produce disturbance in the digestive organs; and disturbance in any function of the human economy certainly may lead to positive disease, even if not of the class called specific.

We are greatly averse to any excuse for filth. Dirt is a foe to good morals, and bad morals are a fruitful source of disease, so that indirectly, if not directly, dirt is inimical to good health.

SCIENTIFIC INTELLIGENCE.

TO DISTINGUISH COAL TAR BENZOLE FROM THAT MADE FROM PETROLEUM.

Brandberg recommends a piece of pitch for this purpose. Pour the liquid to be examined on to a small piece of pitch in a test tube. Genuine benzole dissolves pitch in a few moments to a tarry liquid, while that made from petroleum, as well as petroleum ether and ligroin, is scarcely colored by it, even after having been left in contact with it for several hours. The properties and uses of benzole vary considerably, according to its source, and the above test will therefore be found convenient.

A NEW GALVANIC BATTERY.

M. Laschinoff recommends a convenient form of battery for lecture room experiments. It is a modification of Bunsen's, and is so constructed that both caps can be emptied by inverting the battery, or refilled by turning it back to its original position. In this way, the battery can be got ready at a moment's notice, and the tedious operation of filling and emptying is avoided. It would be impossible, without an illustration, to convey an idea of the contrivance; but our readers may be able to invent something of the kind, now that they know the thing has been done.

A NEW CINCHONA ALKALOID.

D. Howard observed that, in analyzing certain quinine salts, a considerable loss was always encountered. This led to a systematic examination of the subject, and he discovered a new alkaloid, differing in its chemical properties from quinine and cinchonine. What peculiar physiological properties the new alkaloid may have has not been determined, nor has the author given a name to his bantling. The probabilities are that it is nearly identical with quinine, and that it is contained in most cinchona bark. It is said that Liebig's extract of meat contains an alkaloid analogous to caffein and theobroma, which may account for the peculiar action of this form of meat.

A CASE OF POISONING WITH NITRO-BENZOLE.

A British medical journal reports a case of poisoning with nitro-benzole; and as this article is extensively employed as a substitute for bitter almonds, in confectionery and cake, it is well to caution the public against its use. A healthy workman, in sucking some of the nitro-benzole, in a syphon, accidentally swallowed a small quantity. He continued for two hours at his work, when he was seized with headache, loss of memory, and difficulty of speech; his countenance was livid; then followed convulsions and unconsciousness. Five hours after the accident, the physician observed cold extremities, enlarged pupils, unconscious urinal and excremental passages, then vomiting. Although every effort was made to save the man's life, all remedies proved in vain, and he died after three days of great suffering. It is thus conclusively shown that nitro benzole, like its derivative aniline, is a poisonous substance, and one that ought to be handled with care.

NEW SOURCE FOR BENZOIC ACID.

The urine of horses and cattle is utilized in Northern Prussia for the manufacture of benzoic acid. One house at Königsberg supplies the market from this source. The establishment makes 7,700 lbs. of benzoic acid annually, for which 3,850,000 lbs. of urine are required, not to speak of ship loads of fuel to evaporate it. Benzoic acid is now chiefly used in the manufacture of a red color for woolen goods, and is also highly prized in making certain kinds of perfumery.

PREMATURE DISCHARGE OF NITRO-GLYCERIN AT HOOSAC TUNNEL.

There appears to be some danger in employing electrical discharges during a thunder storm. At Hoosac, the connection was made with a battery ready to explode a large quantity of nitro-glycerin, when the whole series of drill holes was fired by the sudden passage of an electric cloud, before all the workmen could get out of the way. A similar experience in Europe ought to teach greater caution in making connections with the electric wires during thunder storms. Telegraphic operators understand the danger and keep out of the way. Miners ought to be equally cautious.

Preventing Rust.—To make an improved anti-rust composition, Mr. E. J. Powell, of Birmingham, takes equal parts of Russian tallow and the greasy matter obtained by the distillation of resin oil, and called anti-friction grease. He fuses the said tallow and grease together, in a vessel heated by steam or hot water, and to each 100 lb. of the mixture he adds two pounds of mercurial ointment, and one pound of lampblack. He first melts and thoroughly incorporates the tallow and grease, before adding the other ingredients, and when the whole has been thoroughly incorporated, the composition is either cast into blocks or masses of a convenient size, or allowed to cool in the vessel in which it is made, and afterwards removed.

The Firing of Gunpowder in Closed Chambers.

Captain Andrew Noble, F. R. S., recently gave a lecture on the pressure of fired gunpowder, at the Royal Institution, and made known some experiments of late date, in which large charges of powder were fired in closed chambers.

He said that Rumford only succeeded, in determining the tension of the powder gases, when the powder occupied less than 70 per cent of the chamber in which it was fired; his charges were also insignificant, and his results were extravagantly high. Rodman's results were also too high, and he did not determine the tension where the powder occupied a larger proportion of the space than 50 per cent.

At Elswick, however, they had been able not only to determine the tension of the gases at various densities, but had exploded large charges filling entirely the chambers of closed vessels, and had altogether retained, and, by means of a special arrangement, discharged at pleasure the gaseous products of combustion.

The inflamed products are confined in a chamber, and the pressure is determined by means of a "crusher" arrangement, in which the pressure of the gases exerts itself on a steel piston, which then crushes, more or less, a copper cylinder. The charge is exploded by one of Mr. Abel's fuses. The current passes through an insulated cone, which, the moment the charge is fired, destroys the insulating material and effectually closes the passage. On taking out the crusher apparatus, it was found that a portion of the solid steel projecting into the charge had been melted, and apparently run; also the head of a hardened steel screw had evidently fused. These effects were produced in the exceedingly short time of 32 seconds. By way of comparison Captain Noble put, for 37 seconds, a similar piece of steel into one of the hottest of Siemens' regenerative furnaces, at a temperature probably of about 3300 degrees Fah. The steel was raised to a temperature of about 180 degrees Fah. The temperature of the fusion already mentioned may have been affected by chemical changes through which the fused metal may have passed.

In the preceding experiment Captain Noble determined the tension of three quarters of a pound of R. L. G. powder, completely filling the chamber in which it was fired, and having no escape whatever, to be about 32 tons on the square inch. For the purpose of that lecture at the Royal Institution, he had determined to make a similar arrangement with L. G. and pellet. He had done so, the results were successful, and the gas was entirely confined. But in the first case, when he got up to the cylinder, it was making a singular crepitating noise, due probably to the sudden application of great internal heat. The temperature of the exterior of the cylinder rose rapidly to 111° Fah., and then remained nearly stationary for some time. He then let the gases escape, which they did with a sharp hissing noise, rising to a scream when any obstacle was placed on the orifice. With the escaping gases there was not the slightest appearance of smoke, vapor, or color of any kind. The pressure indicated by the L. G. was 37 tons on the square inch, or about 5,600 atmospheres.

He had upon the lecture table, in sealed bottles, the solid residues of combustion from the L. G. and also from pebble. In each cylinder had been placed platinum wire and foil of different degrees of thickness. These had disappeared, and he was unable to say in what chemical state they were until the residues had been examined. He looked upon the success of these experiments as being of great importance, for not only, with the assistance of his friend and colleague in the researches, Mr. Abel, would it be possible to determine the various products of combustion when the powder was fired at its maximum pressure, but they would be able to determine whether any, and if so what, change in the products is due to combustion under varying pressure; they would be able to determine the heat of combustion, and to solve important questions.

To show the accuracy of the results of the experiments, he called attention to the fact that the curves of tension and density of the powder gases in close chambers, agree very nearly with the curves obtained from observations of the tensions in the bores of guns.

The following are the practical conclusions deduced from the investigations:—(1) The maximum of pressure of fired gunpowder, unrelieved by expansion, is not much above 40 tons to the square inch. (2) In large guns, owing to the violent oscillations produced by the ignition of a large mass of powder, the pressure of the gas is liable to be locally exalted even above its normal tension in a perfectly closed vessel, and this intensification of pressure endangers the gun, without adding to useful effect. (3) Where large charges are made, quick-burning powder increases the strain upon the gun, without augmenting the velocity of the shot. (4) The position of the vent or firing point exercises an important influence on the intensity of wave action, and in further enlarging the dimensions of heavy guns we must look to improved powder and improved methods of firing the charge, so as to avoid as much as possible throwing the ignited gases into violent oscillation. (5) That in all cases it is desirable to have the charges as short as possible, so as to reduce the run of the ga to the shortest limit. Hence increase of the diameter of the gun, by shortening the charge, tends to save the gun from abnormal strains.

Composition of Meteors.

Professor J. E. Willet gives an account, in the *American Journal of Science*, of the meteor which fell in Stewart county, Ga., on October 6, 1869, and Professor Lawrence Smith contributes an analysis of the stone. From these we find that at the time of the occurrence, the sky was clear, and a series of explosions, with a rushing sound, was heard over an extensive region. The stone was seen to fall, and was found to have penetrated the soil to a depth of about ten inches. It weighed nearly thirteen ounces, and was covered with a black crust. The fractured surface exhibited numerous greenish globules imbedded in a whitish granular material, particles of nickeliferous iron, some pyrites, and a few specks of chrome iron being visible throughout its mass. The analysis gave the following result: nickeliferous iron, 7·0; magnetic pyrites, 6·10; bronzite (or hornblende), olivine, albite (or oligoclase), and chrome iron, estimated in mass, 86·90.

Coal in Wyoming Territory.

According to Prof. Hayden, the coal measures of this territory cover an area of about 100,000 square miles. The whole country, from a point one hundred miles west of Cheyenne to the extreme western boundary of the territory, is underlaid with one immense layer of coal, at an average depth of eighty feet. The Wyoming coal regions are greater in extent than those of Pennsylvania, and equal in area to all yet west of the Wabash and south of the Ohio river.

The mines are now being worked are along the Union Pacific Railroad, at different points between Laramie and Wasatch. The first that we come to, in going west, is the Carbon mine, 140 miles west of Cheyenne. The coal here is reached by a perpendicular shaft seventy feet in depth. The vein is from six to nine feet.

The Carbon coal is the best for making gas that has been found in the territories; the works at Denver and Omaha are using it. Hallville, 283 miles west of Cheyenne, is on Bitter Creek, Carter county. There are two workable veins here—the upper ten, and the lower six feet thick—with a strata of soapstone between.

The coal is of great purity, and used mostly for domestic purposes. Fifteen thousand tuns of this coal were sold in Omaha this year. Forty miles west of Hallville is the Vandyke mine. This coal is used all through the territories for steam and blacksmithing purposes. Eighty thousand tuns of it were consumed in the machine shops at Omaha during last year. Nine miles east of the Vandyke mines are Rock springs. Here is an open drift mine, in the side of a hill, an eight-foot vein. The product is about 3,500 tuns a month.

All the coal banks in Wyoming are now producing a total of about 1,500 tuns a day. New openings are being made at various points. Analyses of three different beds gives the following result:

	Point of Rocks.	Carbon.	Rock Creek.
Carbon	64·70	51·67	6·134
Ash	4·40	6·17	1·50
Sulphur	0·42	2·88	2·00
Volatile matter	30·48	27·68	35·16

It is Prof. Hayden's opinion that Wyoming coal is the best west of the Missouri, except that of Boulder county, Colorado. In general heating properties, in freedom from sulphur, and in impassive resistance to atmospheric influence, it is certainly superior. A Philadelphia journal, commenting on its merits, says: "It is claimed that it will make more steam than the same quantity of Lehigh coal; that it is better for domestic uses, or for propelling machinery, and especially for gas generation, averaging 10,000 feet per tun, while Pittsburgh coal averages only 8,500. It has less waste, showing a smaller proportion of ashes and clinkers. It is said that, while on the Pennsylvania Central Railroad a tun of anthracite will run an engine forty miles, a tun of Wyoming coal will propel it at least seventy-five miles. It is said, also, to excel anthracite as a smelting coal, being used with great success at Omaha in making iron; it adds to the grain and toughness of the metal."

The utility of these vast coal deposits becomes the more apparent when we look at the remarkable iron beds found in their immediate vicinity.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of March, 1871:

During the month, there were 618 visits of inspection made, and 1,346 boilers examined—1,289 externally and 298 internally, while there were 118 tested by hydraulic pressure. The number of defects in all discovered were 511, of which 100 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 20—1 dangerous; fractures, in all, 32—13 dangerous; burned plates, 35—9 dangerous; blistered plates, 53—4 dangerous; cases of sediment and deposit, 55—6 dangerous. Care should be taken that the water for supplying boilers is taken from where it is free from dirt. In saw mills, especially those located in the lumber districts, sufficient attention is not given to this matter. The suction pipe of the pump is run into the nearest water, which may be shallow and liable to get muddy, or filled at times with floating matter, that sooner or later gives trouble. Here is a case in point. An inspector writes: "In the boilers of a saw mill I found saw dust nearly to the top of the tubes, the boiler was in danger of being burned, and the valves were clogged and working badly. I regard this as a dangerous case." The difficulty was remedied, and will not probably occur again. In another case: "For want of being properly cleaned, the back sheet came down, and extensive repairs were necessary." If the water with which boilers are filled and supplied be of a character to make a deposit continually, there must be hand holes easy of access—so that the interior of the boiler can be examined and cleaned, if need be, at least once a week. Cases of incrustation and scale, 70—8 dangerous; cases of external corrosion, 30—4 dangerous; cases of internal corrosion, 10—2 dangerous; cases of internal grooving, 10; water gages out of order, 38—4 dangerous; blow-out apparatus out of order, 5—1 dangerous; safety valves overloaded and out of order, 25—18 dangerous; pressure gages out of order, 80—7 dangerous, varying from —7 to +20; boilers without gages, 3—1 dangerous; cases of deficiency of water, 17—4 dangerous; broken braces and stays, 16—15 dangerous. An inspector says: "In one set of boilers that were ready to be filled with water preparatory to starting, I found 6 broken stays, in another 3, in another 2, and in another a cracked plate. These boilers had all been examined by the engineer, and in some instances by boiler makers. Boilers condemned, 3—all dangerous.

There were 7 boiler explosions, during the month, by which 9 persons were 9 killed and 5 wounded. The loss in one case is estimated at $30,000.

The Planet Mercury.

In closest proximity to the sun wheels Mercury; in mass not more one fifteenth that of the earth, circling around the sun in less than three of our months, and rotating on his own axis in a time but a few minutes longer than our own day. Owing to the eccentricity of his orbit, the amount of heat and light he receives from the sun is extremely variable, ranging between five and ten times as much as that which reaches the earth. Even under the most favorable of the positions of Mercury, the sun blazes in his skies with a disk nearly five times larger than that which it offers to the observer on the earth.

These certainly are not peculiarities which would encourage the belief that any creatures resembling those with which we are familiar could subsist on this globe. We know too little of the inclination of Mercury's equator to the plane of his orbit to judge much of the nature of his short seasons; but with the high angle usually claimed, it must be admitted that no—to us known—form of life could possibly exist. But climatic conditions may perhaps be modified, rendered, it may be, more dense; or perhaps there may be recognized "in the polar regions places," says Proctor, "suitable for organic existences, while the equatorial and neighboring regions are zones of fire whose dangers the bravest Mercurials, the very Livingstones of that planet, would not dare to face."

The New York and Brooklyn Suspension Bridge.

The caisson or foundation on which the New York tower is to rest, differs in some respects from the caisson of the Brooklyn tower. The latter, as our readers are aware, has been sunk into its place, and the granite work of the tower is now progressing.

The caisson for the New York tower is nearly completed, and will be launched in the course of a few days. We recently gave particulars as to its dimensions, iron lining, etc.

Owing to the peculiarity of the excavations to be made on the New York side—sand being expected almost entirely to be met with there, and not boulders, as on the Brooklyn side—pipes for the sand pumps are being introduced into the New York caisson. About fifty of these pumps will be in operation, having pistons from three and a half to four inches in diameter, which are expected to throw the sand to the surface in great quantities. Another improvement introduced into the New York structure is the number and character of the supply shafts. The number is four instead of two, and the character cylindrical instead of square as in the Brooklyn caisson. Besides this, the cylinders are larger, and it is expected that twenty men can carry on operations comfortably in each.

Heliographic Printing.

A patent has been recently taken in England, which consists in an improved method of preparing caseine or curd of milk for subsequent use in the formation of casting blocks, printing blocks, and in preparing the surfaces of paper. The inventors take milk which has become sour and set by keeping, and separate from it the grease and other extractive matters by the following process:—The milk is churned, when sour and set by natural causes, and put into a bag and allowed to drain for about twenty-four hours; boiling water is then poured on it, and it is subjected to a squeezing process. After this the best result is obtained by pouring water at about half boiling temperature on it. It is again squeezed and allowed to stand until it has cooled down, and then washed well in clear cold water with continuous squeezing to remove all the grease and milk they can. When dry, the residuum becomes hard and granular, and is the substance or caseine which is the object of the invention.

Manufacture of Wire.

An English inventor has patented a method, by which the heat is retained in the metal during the process of treating wire. This, it is claimed, produces much better and stronger wire than the old process. His specification states that he secures the end of the wire, as it leaves the first pair of rolls, upon a revolving drum, which takes up the wire in a hot state, so that it coils itself in layers thereon, whereby the heat which is contained is kept in it. The drum may be enclosed in a suitable casing or jacket, to which, if desired, the heat from a fire or other source may be applied, or the drum may be employed without a casing or jacket. When the full length of wire has passed through the first pair of rolls and on to the drum, the action is reversed, and the wire passed through fresh rolls, when it is taken up by another drum, and so on, until the wire is sufficiently reduced. By this means, it is said, that the inventor is enabled to produce longer lengths of wire and of a better finish than heretofore.

WE know not our own motives; how, then, can we pretend to know the motives of others?—LA ROCHEFOUCAULD

Dr. E. Schunck, in a paper read before the Manchester Literary and Philosophical Society at the last meeting, described a new acid—anthraflavic acid—which occurs as a yellow coloring matter accompanying artificial alizarine. When crystallized from alcohol and dried, it has the appearance of a dark lemon yellow silky mass, which under the microscope is seen to consist of slender foursided prisms. The acid is only slighdly soluble in boiling water, and almost insoluble in cold. If pure anthraflavic acid be dissolved in an excess of caustic potash, and the solution be boiled down to dryness, a yellow residue is left, which after being carefully heated, almost to fusion, dissolves in water with a red color. By the action of caustic potash, anthraflavic acid is converted into alizarine, the process being doubtless one of oxidation.

Manufacture of Chlorine.—A recent English patent consists in the employment of a column or tower, or a number of columns or towers connected together in a series, and made of iron or brickwork, or of both, filled with some active reagent or with tiles, bricks, or pieces of burnt clay, or other suitable material, soaked with a solution of such reagent. Through the columns or towers a heated mixture of hydrochloric acid gas and atmospheric air, or oxygen, is caused to pass, whereby chlorine is produced from the hydrochloric acid gas. The columns or towers may be surrounded by suitable coverings, or air spaces, or flues, for the purpose of preventing loss of heat, or of imparting or regulating the heat as the circumstances of the manufacture require.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

Annealing Steel.—F. A. K. asks for the best way of annealing steel. The method I use is: Heat the steel slowly to a bright cherry red, in a charcoal fire, then put it in charcoal dust till cold.—W. F., of Ill.

Diameter and Pitch of Toothed Wheels.—Rule: Multiply the pitch by the number of teeth, and you will have the circumference at the pitch line; divide the result by 3·1416, and you will have the diameter near enough for any practical purpose. To determine the pitch, the diameter and number of teeth being given: Multiply the diameter by 3·1416, and divide the result by the number of teeth.—W. F., of Ill.

Pitch and Diameter of Toothed Wheels.—Let J. W. multiply the number of teeth in the wheel, by the number of 32nds of an inch in the pitch, and cut off the two right-hand figures as decimals. Example: Wheel of 84 teeth, spaces on pitch line 27-32 of an inch; 84 x 27 = 22·68 inches in diameter. If any one can give as simple a rule as this, giving a closer approximation to exactness, I would like to see it.—G. W. P., of N. Y.

D. T., of Cal.—In regard to enamel surfaces for writing, we gave, in the item you refer to, all the information we have yet obtained in regard to it.

W. D., of Ill., asks if a dam six miles below rapids, if it sets the water back to the foot of the rapids, will affect the flow above the rapids, the rapids having six feet fall? Practically it would not. Also, he wishes to know whether if an intermediate dam, one mile above the first, should be erected, the water being all returned to the river, it would lessen the power at the lower dam? Answer: No.

Polish for Wood in the Lathe.—Let W. H. B. dissolve sandarac in spirits of wine (alcohol) in the proportion of one ounce of sandarac to half a pint of spirit; next, shave beeswax one ounce, and dissolve in turpentine to make it into a paste; add the former mixture by degrees to it; then, with a woolen cloth, apply to the work while it is in motion in the lathe, and polish it with a soft linen rag. It will appear as if highly varnished. I find this recipe in the "Cabinet Maker's Companion."—J. B., Jr., Ohio.

M. R. & Co., of ——, wish to know which is the most economical for them, an eighty horse power engine, or two engines of forty horse power each? They need to use eighty horse power only half the time; and the other half, only about forty horse power is required. As a matter of economy there would be little difference. The large engine would lose less by radiation in proportion to power, while it would lose more by friction in proportion to power, when running at only half its capacity. Again, the two engines at forty horse power would together lose more by friction in proportion to power, when running to their full capacity, than one engine giving the same power, when all other things are equal. The question is rather one of convenience than economy.

Case Hardening.—E. B. T., would like to know how to case-harden iron. Here is one way, although there are over a dozen: Take a sheet-iron box, and put in the iron you want to harden, and at the same time put in small pieces of old leather, horn, bones, or cuttings from horses' hoofs, as found at any blacksmith's shop, and then cover the box with a good coat of fire clay, so as to make it air tight. Put it in a fire where you can heat it to a good red heat; keep it so for an hour, then take it out and throw it into cold water, box and all, and your iron will be turned into steel, that is, the surface will be, for about one eighth of an inch in thickness.—A. R., of Ill.

The Sea Horse.—A correspondent sends us a dried specimen of a very curious appearance, asking what it is. We reply, it is a sea-horse—a small fish, found on our Southern coasts, and it swims in upright position, neck and head resembling a horse. Altogether, it is a very singular fish. We shall shortly represent it by an engraving.

H. C. M., of Me.—There is a difference of opinion as to which is the best published method of short-hand writing. We like Pitman's Phonography the best. There is a system called Tachigraphy, but it will not do for reporting.

T. H., of Mich.—If you are not accustomed to chemical manipulation, you will not be very likely to succeed in making a good article of gun cotton. Twine of gun cotton, is not, so far as we are aware, kept for sale. You could twist it for yourself, with proper care, if you had the gun cotton. This you can order, cheaper than you can make it, from any dealer in photograph materials.

Cleaning Guns.—I have been using a rifle gun for fifteen years, and have to wipe or clean it yet for the first time; and I have fired it as much as 100 rounds in a day. All I do is to rub the patch on some tallow, placed in the box, on the butt of the gun. My gun is in better order today than it was when I brought it from the shop. If this be of any use to G. D. and others, they are welcome.—F. S. S., of Ohio.

J. A. F., of Mo.—Condensation never changes sensible heat to latent. Steam in the low pressure engine does not condense itself, but is condensed by having its heat extracted. Heat always aids the expansion and the extraction of heat always assists the compression of gases.

L. C. M.—There has, so far as we know, been no limit discovered to the the contraction of iron by cold. A bar of iron is shorter at —40° than at zero. The weights of different bodies do not affect their rates of descent by gravity. Bodies of different weights rolling down one incline, and starting from the same point, will, all else being equal, reach the bottom at the same instant, and would then roll up another inclined plane to the same point before stopping.

NEW BOOKS AND PUBLICATIONS.

The Life and Letters of Hugh Miller. By Peter Bayne, M.A., author of "The Christian Life," etc. In two volumes. Boston: Gould & Lincoln, 59 Washington street New York: Sheldon & Co.; Cincinnati: Geo. S. Blanchard & Co.

We venture to say the year has not yet given to the world a book of greater general interest than this. The inner life of a great man, as Hugh Miller unquestionably was, is always a useful and entertaining study. In no other way can we get such an insight into private and domestic character as through letters. In them we find innumerable clues to heart secrets, to habits of thought, to impulses and emotions, which we seek in vain in the elaborate writings or public speeches of prominent men. No man will read these letters of Hugh Miller without increased respect for the author. They show that he sought earnestly for truth; that he was charitable, honest, and fearless in the expression of opinion; that in his domestic relations he was kind and affectionate, and endowed with all those qualities which secure esteem and love. The author and publishers have done the world a real service in the production of these volumes. No man, woman, or child can read them without being improved. The printing, binding, and general sty the work are all first class.

Patent Laws and Practice of Obtaining Letters Patent for Inventions, in the United States and Foreign Countries, including Copyright and Trademark Laws. By Charles Sidney Whitman, of the Supreme Court of the United States. Washington: W. H. & O. H. Morrison, Publishers.

This is an octavo volume of over 700 pages, in binding of the usual style of law books. The title sufficiently sets forth the character of its contents, which are copiously indexed. While it contains but little not found in other works, it has condensed in a convenient manner a great deal of information important to inventors and patentees.

A Correction.—We regret that in our notice of "Specimens of Engraving on Wood," by S. S. Kilburn, of No. 96 Washington street, Boston, Mass. published on page 252, current volume, a printer's error gave the address as Brooklyn.

The *Phrenological Journal*, for May, contains a biography of Edward Harris, the eminent manufacturer of Woonsocket, R. I., as its first article. This interesting article is followed by the usual variety of entertaining and instructive reading, monthly provided in this popular journal. Samuel R. Wells, publisher, 389 Broadway, New York.

The *Southern Magazine*, a new cotemporary, has reached its fifth number It bids fair to rival, in interest, its older competitors. Its table of contents for May is varied and entertaining, embracing tales, essays, and poems, with an editorial *melange* as dessert, entitled the "Green Table." Published by Murdoch, Browne & Hill, 166 Baltimore street, Baltimore, Md.

Lippincott's Magazine, for May, contains a poem by Margaret F. Preston, entitled, "Vittoria Colonna to Michael Angelo," a fine essay on the "Monuments of Ancient America," by Charles Morris; "Curiosities of the 'Pay Streak,'" by Prentice Mulford; an instalment of the interesting story 'Rookstone," by Katherine S. Macquoid, and much other matter of interest and value. Published by J. B. Lippincott & Co., Philadelphia; New York Agency, 25 Bond street.

The *Atlantic Monthly*, for May, opens with a most readable article, entitled the "Descent of Fire," by John Fiske. Among the heavier articles which follow, is a thoughtful one on the "Organization of Labor," by Richard F. Hinton. Longfellow contributes a short poem, "Vox Populi," Clarence King gives us an entertaining sketch of "Mountaineering in the Sierra Nevada," and Dr. Williams continues to instruct us in the matter of "Eyes, and How to Use them." This strong framework is gracefully adorned by lighter articles and tales. The number is more than usually excellent. Fields, Osgood & Co., Boston, Publishers. New York and Brooklyn office, 713 Broadway, New York.

Wood's Household Magazine, published by S. S. Wood, Newburgh, N. Y. is a ten cent monthly, which gives as much for the price as any published, as a glance at the May number will prove.

Drake's Magazine for Boys and Girls, is a tastefully illustrated monthly, full of entertaining reading for the little folks; combining, in a skillful manner, instruction with amusement. J. W. Burke & Co., Macon, Ga.

The *New York Medical Journal*, for April, published by D. Appleton & Co., fully sustains its character as a leading exponent of medical progress. No journal of this kind published on this continent has more able contributors, and the style in which the magazine is printed is an honor to medical literature.

Among other medical journals which come to us as exchanges, the following are all good live publications: The *Chicago Medical Journal*, W. B. Keen & Cooke, 113 and 115 State street, Chicago, Ill.; the *Northwestern Medical and Surgical Journal*, Alexander J. Stone, editor and proprietor, St. Paul, Minn.; the *Journal of Materia Medica*, Tilden & Co., New Lebanon N. Y.; the *Richmond and Louisville Medical Journal*, E. S. Gaillard, M.D. editor and proprietor, Louisville, Ky.; the *Ohio Medical and Surgical Reporter*, L. H. Witte, 17 Monumental Park, Cleveland, Ohio (a bi-monthly); the *Atlanta Medical and Surgical Journal*, Drs. W. F. and J. G. Westmoreland, editors, Atlanta, Ga.; the *Medical and Surgical Reporter* (a weekly) S. W. Butler, proprietor, 115 South Seventh street, Philadelphia, Pa.; office in New York, Z. P. Hatch, 737 Broadway.

No. 3 of the *Workshop*, E. Steiger, publisher, 22 and 24 Frankfort street, New York, sustains its fine reputation as a repertory of industrial design.

Hall's Journal of Health, for May, published by Hurd & Houghton, 13 Astor Place, New York, is a spicily written collation of short essays on health topics mainly, moral health as well as physical receiving attention. If not always correct in its statement of facts, it is always readable.

The *Herald of Health and Journal of Physical Culture*, published by Wood & Holbrook 13 and 15 Laight street, New York, is doing good work in imparting a general knowledge of the principles of hygiene. It is one of the most readable of this class of publications.

Good Health: A Journal of Physical and Mental Culture. Alexander Moore, publisher, Boston, Mass. This journal makes a distinctive feature of describing, in a popular style, such diseases as are most common, and which may be avoided by reasonable prudence. It also publishes many useful articles upon collateral subjects, and is altogether a publication well adapted to family instruction.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

PUTTING UP ICE CREAM, ETC.—Ignazio Allegretti, Philadelphia, Pa.—It is common, in this city, when you want ice cream to take home, to call in at the confectioner's, have the cream put up in a paper, and take it with you, Thus put up, cream will not begin to melt for some time. The inventor has made a slight improvement in this line, for which he has lately received a patent. In his specification he says: The ice cream or water ice to be packed and served up by my improved method, is first frozen in any ordinary known manner; it is then put up in metallic molds, preferably of parallelopipedic form; but of any form, if desired. The metallic mold containing the ice cream is then placed in a dry atmosphere, kept at a very low temperature (in some cases it is kept as low as 30° below zero), and there it is kept long enough for the whole mass to absorb, and be reduced to the low temperature. Meanwhile I prepare boxes of non-conductor-of-heat material, such as open porous pasteboard, of the shape, but slightly larger than, the block of ice cream; and I place the boxes also in a cold dry atmosphere for a certain time. The block of ice cream is taken out of the mold, immediately wrapped in a piece of paper, and placed in the refrigerated pasteboard box, the laps of the paper being folded over, and, if desired, a spoon placed thereon; the lid is put on, and the cream is ready to be delivered or served up; or it may be replaced in a cold dry air refrigerator, and there kept for any length of time without losing any of its qualities. The cream or water ice put up in this manner will remain firm and solid for a length of time lasting from one to four hours, according to the state of the weather. I claim, as a new article of manufacture and commerce, ice creams or water ices, put up in the manner herein specified, and kept for sale ready for use in rations, as it were, substantially as herein specified.

CORN PLANTER.—J. Dyson Delap, Tyrone, Pa.—This invention consists in a rod arranged to reciprocate within a seed discharging tube, for the purpose of causing the seed to be delivered in the furrow with uniformity; also, in a seed slide arranged to reciprocate in the bottom of the seed box, and provided with an aperture in which the seed lodges, and from which it is delivered by a spring rod operated by a tappet arm on an oscillating bar, which derives motion from the covering roller.

WATER WHEEL.—John S. Warren, Fishkill-on-the-Hudson, N. Y.—This invention is intended to supply a mode of operating the chutes of water wheels, whereby objections to the ordinary mode are obviated, and an increase of power is obtained. The improvement is especially adapted to wheels operating upon the turbine principle. By turning the hub pieces simultaneously, all the chutes are given two distinct motions: they will move endwise, or slide forward in contact with the stationary plates, and will be thrown bodily towards the wheel at the same time, thus reducing the thickness or breadth of the water apertures, while preserving the true curve or line of contact of the water with the buckets of the wheel.

FIRE-PLACE GRATE.—William H. Garrett, Cannonsburg, Pa.—This invention consists of a metal sifter suspended under the grate, by resting at the rear, on studs projecting from the back wall, and at the front by chains from the top bars of the grate, or on studs in the wall thereabout, so that it may be swung back and forth for sifting the cinders, and then be brought forward and its contents emptied on the fire.

COMPOSITION FOR COATING PHOTOGRAPHIC PICTURES.—Henry Happel, New York city.—This invention relates to a compound made of a solution of shellac or other gum in alcohol, and mixed with aniline red or other pigment, in such a manner that, when a photographic picture is coated with this compound, a certain lively appearance is imparted to the same, and its effect is materially improved. The proportion in which the pigment is mixed with the lacker must be determined by experience, and in some cases blue or other pigments may be used instead of red; but on ordinary photographic pictures the best result is obtained by preparing a lacker of purified shellac dissolved in alcohol, and mixing therewith a small quantity of aniline red, which readily dissolves in alcohol, and can therefore be easily introduced in said lacker.

PACKAGE FOR OYSTERS, CLAMS, ETC.—M. W. Brown, New York city.—I take paper or cloth, and treat the same with a compound of glycerin and caustic potash, or with any other compound or material which will render the paper or cloth tough, pliable, and impervious to air, water or fat. From the paper or cloth thus produced, I make bags or packages of any suitable form or shape, by preference in the form of paper bags, the edges of the paper or cloth being united by a suitable cement, and after these bags have been charged with oysters, they are tied like flour bags; or they may be sealed by securing in their mouth a tube or other material, and stopping up said tube with cork or other suitable material, and they are ready for the market or for transportation. By these means, a package for oysters or clams is obtained, which is much cheaper than the tin cans at present used for this purpose; and, furthermore, the package can be opened and reclosed without trouble.

SPARK ARRESTER.—William W. Elliott, Elliott's Mills, Miss.—This invention has for its object to arrest the sparks, cinders, etc., that come from the fire flues of a steam boiler, and hold them in a chamber provided for their reception until they become dead and harmless. This chamber is formed by a hinged box applied to the front of the locomotive boiler.

PILE FOR NUT BLANKS, TUBES, ETC.—Jonathan Ostrander, Manchester, Va.—This invention consists of a pile, oblong or square in cross section, and made up of six pieces, viz: a top piece, bottom piece, two side pieces, and two double-headed, wornout railroad rails, placed between the top and bottom pieces, and in contact with the side pieces; said top, bottom, and side pieces being rolled, so as to fit those parts of the rails which they respectively join.

PILE FOR NUT BLANKS, TUBES, ETC.—Jonathan Ostrander, Manchester, Va.—This invention relates to a pile to be welded by rolling into a skelp, from which nut blanks may be sawn off, or hollow shafting or tubing be rolled. The pile has a cylindrical bore, and is made up of two longitudinal halves, each triangular in cross section, so that, when the dividing plane runs diagonally of the pile, it consequently presents the greatest amount of welding surface that can be obtained in right lines.

WATER ELEVATOR AND CARRIER.—Archibald A. and Robert P. McPheeters, Arbor Hill, Va.—This invention consists in rollers placed lengthwise of the carrier, one at each side of the chain wheel, for the purpose of preventing the chain from slipping off the wheel in raising a bucket from a point not directly beneath it; and in a cross bar attached to the lower side of the carrier, and bearing in its ends spring bolts, which pass under the rails of the elevated track, and serve to prevent the wheels from being thrown therefrom, the spring bolts slipping back when passing the supports.

TONGUE FOR HARVESTERS.—Martin Rohrer, Polo, Ill.—This invention has for its object to enable a harvester to be turned in the smallest possible space, and it therefore relates to a tongue made in two parts, which are hinged together, and provided with a latch device for holding the two parts of the tongue in line as long as the draft is forward, which latch device is to be raised, and the forward part of the tongue swung to one side, prior to the turning of the machine.

CAMERA BOX.—Orin Ackerman, Carthage, N. Y.—This invention includes a novel mechanism for enabling pictures of any size, and in any desired number, at one sitting, to be taken by the use of one and the same camera box, which is made movable vertically and laterally, outside of an independent stationary box; also a novel mechanism for adjusting the pitch of the camera box, and an application of a looking-glass to the camera box in such a manner as to enable the operator to watch the sitter while turning his back toward him.

GATE.—Noah Parker, Bedford Springs, Ky.—This invention relates to improvements in gates, more especially designed for farm use, whereby a gate may be secured at various elevations above the surface of the ground, in order to avoid the necessity of clearing away snow, or other obstructions, and to accommodate the passage of the smaller animals, such as sheep and hogs, fowls, etc., while the larger, such as horses and bullocks, are retained in the inclosure.

CORN PLANTER.—Henry Baughman, Sandusky, Ohio.—This invention relates to a corn planter, in which the plows are attached to a frame, hinged at its rear side to the axle of the transporting wheels, and supported at its front side upon a main frame, which is supported at its rear end upon the axle, and at its front end upon trucks.

ASH SIFTER.—George W. Taylor, Baltimore, Md.—This invention consists in the combination of a cylindrical vessel, having a closely fitting removable cover, and a perforated bottom, fitting it to discharge the office of a sifter for coal-cinders, with a pan on which the sifter sits, and on which it may be vibrated, so as to cause the ashes to fall through the sifter into the pan, whence they are prevented from rising by the close connection between pan and sifter at the top of the former.

POTATO DIGGER.—Sherman E. Anthony, Stillwater, N. Y.—This invention consists in a machine that first loosens up the roots and earth in a row of potato hills, by means of tines that run beneath the hills, said tines being inclined downward and backward and attached to parallel bars. The said machine is also provided with a vertical disk fixed on a horizontal shaft, which is mounted in the same frame that supports the aforesaid bars and tines, said disk bearing a row of radial teeth, which, by the rotation of the disk, effect the separation of the potatoes from the loosened earth.

GRIST MILL AND COTTON SEED HULLER.—James W. Smith, Columbus, Ga.—This invention relates to certain improvements in the grist mill for which letters patent No. 81,735 were issued to George N. Annan, Sept. 1, 1868, by which said grist mill is adapted also to the function of hulling cotton seed.

LAMP CHIMNEYS FOR SIGNAL AND OTHER PURPOSES.—Thomas A. Davies, New York city.—This invention relates to a chimney for the head light of a locomotive, and it consists in such a chimney when made parti-colored, in bands running either lengthwise of the chimney or crosswise of the same circumferentially, so as to enable the same chimney, by revolving on its axis, or by vertical adjustment, according to the direction of its colored bands, to show lights of different hues.

DIRECT ACTION TRIPLE VENT WATER WHEEL.—Ephraim L. Small, Urbana, Ohio.—This invention relates to a water wheel, constructed on the theory that all the effect produced by the water is due to its direct action on the buckets, and not all to its reactive force. The invention aims at such a construction of the gates, chutes, wheel and case, as facilitates to the greatest extent both the direct action of the water, and its escape from the wheel, after the direct action has ceased.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—SOLUTION FOR ELECTRO GILDING.—Will some one inform me how I can prepare a gold solution for electro gilding that will, when used, give me the red coin color?—C. E. B.

2.—DRAFT TUBES FOR TURBINES.—In practice do draft tubes, applied to water wheels, utilize as fully the effect of a given head of water, as when the wheel is put at the bottom of fall?—L. P. & B.

3.—PRUSSIAN BLUE.—Can any of your correspondents tell me, through your "Answers" column, how to make Turnbull's Prussian blue?—J. B.

4.—BLOWING OFF BOILERS.—Will some of your intelligent readers give me their views on the following subject? I have two boilers running continually, and I blow them off on alternate Saturday nights. In about ten or fifteen minutes after, I draw my fire at a pressure of about twenty-five or thirty pounds, which I consider is all right for safety and prevention of too sudden a contraction of the boiler. But, I have a boss—would be—who says "he has talked a good deal on the theory of boiler tending," and he contends, with the advice of others, that it is better and safer to keep the fire in the furnace, after opening the blow-off valve, until the water is going out of sight in the water gage glass indicator, and then haul out the fire. I would like to have the advice of some of the boiler inspectors of the Hartford Boiler Insurance Company on this subject.—C. T.

5.—SAFETY VALVE.—I would like to have a practical rule to graduate the lever of a safety valve, the following things being given: weight of ball, weight of lever and valve, diameter of valve, and pressure of steam per square inch; also to find the distance from fulcrum to the center of ball.—C. K.

6.—BLEACHING WAX.—Is there any process for whitening yellow beeswax, other than the one followed in this country—that is, by melting the wax, and pouring it into shavings or ribbons, and exposing it to the sun and dew until it loses its brown color?—J. C.

7.—HANGING IRON SHUTTERS.—I wish to know the best mode of hanging iron shutters to brick buildings, where there are no arrangements made for such blinds in the building.—O. A., Jr.

8.—ETCHING STEEL.—I would like a recipe for etching steel plates in large quantities, in the most expeditious manner. Can any subscriber furnish the recipe?—J. O.

9.—SOLUTION FOR ELECTRO COPPERING.—Would some one give me a recipe for a solution (bath) for copper plating, on iron or steel, without heat, articles of the size, for instance, of hames for carriage harness?—F. R. A.

10.—BRONZING STATUETTES.—Will some of your numerous readers give me a recipe for bronzing plaster and wood statuettes in imitation of French bronzes?—W. H. S. B.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

890.—SEPARATING TIN FROM TINNED IRON.—A. Ott, New York city. April 4, 1871.

892.—SUGAR CANE MILL.—G. La F. and H. C. Squier, Buffalo, N.Y. April 4, 1871.

897.—PACKING FOR PISTON RODS.—W. S. Fish, Mystic, Conn. April 4, 1871.

901.—LUBRICATOR.—Joseph Moore, San Francisco, Cal. April 5, 1871.

907.—PYROMETER.—Robert Spencer, New York city. April 5, 1871.

908.—COMBINED SAD AND FLUTING IRON.—F. Myers, New York city. April 5, 1871.

910.—FURNACES AND BOILERS.—F. A. Woodson, Selma, Ala. April 5, 1871.

916.—SELF-RAISING FLOUR.—Gorham Gray, Boston, Mass. April 6, 1871.

925.—ASPHALTE ROADS AND PAVEMENTS.—J. L. Graham, New York city. April 8, 1871.

929.—BREECH-LOADING FIREARMS.—F. J. Abbey and J. H. Foster, Chicago, Ill. April 8, 1871.

937.—BOOT SEWING MACHINERY.—Charles Goodyear, Jr., New York city. April 8, 1871.

Foreign Patents.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING APRIL 25, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

113,961.—CHIMNEY COWL.—W. N. Abbott, New York city.
113,962.—SEWING MACHINE.—Hosea P. Aldrich, Boston, Mass.
113,963.—CANNON.—Hiram J. Allen, Arkadelphia, Ark.
113,964.—SKEWERS.—Chauncey Andrews, Paterson, N. J.
113,965.—KNITTING MACHINE.—J. M. Armour, Syracuse, N.Y.
113,966.—DUMB BELL.—Ellis Ballou, Zanesville, Ohio.
113,967.—CHAIR.—Franklin Barber, Detroit, Mich.
113,968.—CARBURETING AIR.—C. C. Beers, Boston, Mass.
113,969.—STOVE.—G. C. Benton, Port Huron, Mich.
113,970.—CLOCK.—I. G. Blake, Worcester, Mass.
113,971.—CULINARY VESSEL.—W. H. Bloom, Tiffin, O.
113,972.—BOLT REEL.—J. R. Bradfield, Ada, Mich.
113,973.—FILTERING MATERIAL.—L. Brandeis, Brooklyn, N.Y.
113,974.—TRUNK FASTENER.—D. W. Brockway, Dover, Me.
113,975.—HAY FORK.—J. T. H. Brown, Greenup, Ill.
113,976.—TELEGRAPH RELAY.—H. S. L. Bryan, Cedar Rapids, Iowa.
113,977.—PICKS.—Augustus Buerkle, Pittsburgh, Pa.
113,978.—VAPORIZING HYDROCARBONS.—John Butler, New York city.
113,979.—BABY TENDER.—A. H. Carson, Newport, R. I., and Andrew Brown, Troy, N. Y.
113,980.—SMOKE STACK.—E. A. Castellaw, Savannah, Ga.
113,981.—BOAT DETACHING.—D. L. Cohen, Pensacola, Fla.
113,982.—LAMP SHADE.—M. H. Collins, Chelsea, Mass.
113,983.—REEFING SAILS.—A. G. Crossman, Huntington, N.Y.
113,984.—CENTER BOARD.—A. G. Crossman, Huntington, N.Y.
113,985.—DUST PAN.—F. L. Daniels and J. Russell, Boston, Mass.
113,986.—CASTING PIPE.—John Demarest, Mott Haven, N. Y
113,987.—WASHING MACHINE.—J. H. Doll, Etna, Ill.
113,988.—TIME DETECTOR.—James Dunning, Bangor, Me.
113,989.—STEAM ENGINE.—Thos. Edwards, Birmingham, Eng.
113,990.—HARVESTER.—John H. Elwood, Polo, Ill.
113,991.—PAPER FILE.—Geo. W. Emerson, Chicago, Ill.
113,992.—SAW.—Jas. E. Emerson, Trenton, N. J.
113,993.—SAW FOR STONE.—Jas. E. Emerson, Trenton, N. J.
113,994.—MELODEON.—Peter Engers, Jefferson Furnace, Pa
113,995.—MEDICAL COMPOUND.—W. H. Farrar, Richmond, Va.
113,996.—BATTERY GUN.—William Fields, Wilmington, Del
113,997.—GRAIN MASHING.—C. H. Frings, Centreton, Mo.
113,998.—GATE HINGE.—George Garrett, Elkhart, Ill.
113,999.—STAMPING WEARING APPAREL, ETC.—Chas. Gernert Philadelphia, Pa.
114,000.—BUGGY.—James R. Gilman, South Bend, Ind.
114,001.—BURGLAR ALARM.—Louis C. Gosson, Trenton, N. J
114,002.—PLOWS.—Jos. S. Godfrey, Rochester, Pa.
114,003.—HARVESTERS.—Phineas Gregg, Brownsville, Mich
114,004.—SLITTING RAGS FOR CARPETS.—Marion Green, Coldwater, Mich.
114,005.—BATTERY ZINC.—Edward A. Hill, Chicago, Ill.
114,006.—GALVANIC BATTERY.—Edward A. Hill, Chicago, Ill
114,007.—HOTEL ANNUNCIATOR.—Edward A. Hill, Chicago, Ill.
114,008.—TATTING SHUTTLE.—C. Hingher, New Brunswick, N.J
114,009.—HINGE.—Phillip Hires, Columbus, Ky.
114,010.—CUT-OFF.—Birdsill Holly, Lockport, N. Y.
114,011.—BRICK MACHINE.—D. J. Hunter, Somerville, Mass.
114,012.—COFFEE POT.—P. H. Inman and C. B. Withington Janesville, Wis.
114,013.—HEATING AND VENTILATING DRUM.—Royal Jennings, Shelbyville, Ind.
114,014.—LEVEL AND CLINOMETER.—Wm. Johnson, Edisto Island, S.C.
114,015.—CAR COUPLING.—J. W. Jones of Philip De Catesby, Hereford, Md.
114,016.—CHURN DASHER.—Wm. F. Jones, Easton, Kan.
114,017.—PAINT.—Wm. N. Jordan, Cambridge, Mass.
114,018.—COOKING STOVE.—John H. Keyser, New York city.
114,019.—STRAP HINGE.—Wm. J. Lewis, Pittsburgh, Pa.
114,020.—PRINTING PRESS.—J. C. MacDonald, Waddon, and Joseph Calverly, Camberwell, Eng.
114,021.—THRASHING MACHINE.—M. H. Mansfield, Ashland, O.
114,022.—PADDLE WHEEL.—E. Mathers, Harrisville, W.Va.
114,023.—GRAIN SEPARATOR.—Jos. Miller, Detroit, Mich.
114,024.—STEAM BOILER.—Thomas F. Morrison, Bryan, O.
114,025.—CARRIAGE STEPS.—F. B. Morse, Plantsville, Conn.
114,026.—FELLY PLATES.—F. B. Morse, Plantsville, Conn.
114,027.—SPIRIT LEVEL.—Joab Morss and Franklin B. Abel Philadelphia, Pa.
114,028.—KING BOLT FOR CARS.—S. W. Murray and B. P Lamason, Milton, Pa.
114,029.—WIRE FENCE.—Z. Nicholson, Haddonfield, N. J.
114,030.—WASHING MACHINE.—J. M. Noble, Delhi, Iowa.
114,031.—PAPER-FEEDING MACHINE.—O. Norelius, Minneapolis, Minn.
114,032.—ADDRESSING MACHINE.—P. O'Conner, Youngstown Ohio.
114,033.—GANG PLOW.—Jos. Oler, Eagle Point, Ill.
114,034.—SCAFFOLDING.—J. D. Pettit, Rochester, Ind.
114,035.—HOT AIR FURNACE.—J. L. Pfau, Jr., Quincy, Ill.
114,036.—CURTAIN FIXTURE.—P. W. Phillips, Salem, Mass.
114,037.—SHUTTER FASTENER.—J. D. Phyfe and J. D. Perrine New York city.
114,038.—WOOD PAVEMENT.—Albert Potts, Philadelphia, Pa.
114,039.—TRUSS BRIDGE.—T. W. Pratt, Boston, Mass.
114,040.—CULTIVATOR.—I. N. Pyle, Pleasant Mills, Ind.
114,041.—POTATO DIGGER.—S. Ransome, Kingsville, Ohio.
114,042.—SULPHURIC ACID.—St. J. Ravenel, Charleston, S.C.
114,043.—SAW MILL.—John Richards, Philadelphia, Pa.
114,044.—PLOW MOLD BOARD.—L. P. Rider, Pittsburgh, Pa Antedated April 12, 1871.
114,045.—FIREPLACE.—P. M. Roche, Cleveland, Ohio.
114,046.—STOVE.—P. Rohdin and C. Ostergren, Chicago, Ill.
114,047.—SEED PLANTER.—C. R. Sargent, Newburyport, Mass
114,048.—OILING WOOL, ETC.—C. G. Sargent, Westford, Mass.
114,049.—WATER ELEVATOR.—P. W. Sawyer, Gray, Me.
114,050.—CHURN.—H. Shultdrees, Brookville, Ind.
114,051.—CARRIAGE CLIPS.—M. Seward, New Haven, Conn.

114,052.—Steam Boilers.—George Sewell, Brooklyn, N. Y. Antedated April 22, 1871.

114,053.—Carpet Stretcher.—E. P. Shaffer, Rochester, N.Y.

114,054.—Wagon Brake.—R. C. Shockley, Fayette, Wis.

114,055.—Stove.—A. S. Shontz, Quincy, Ill.

114,056.—Cotton Press.—F. Simmons, New Orleans, La.

114,057.—Fence.—A. C. Sisson, Factoryville, Pa.

114,058.—Carriage Wheel.—J. Y. Sitton, Due West, S. C.

114,059.—Spinning Mules.—Jos. Smith, Preston, England.

114,060.—Passenger Register.—M. Springwoter, Louisville, Ky.

114,061.—Caster.—A. G. Stevens, Manchester, N. H.

114,062.—Animal Trap.—J. N. Stow and R. Loop, Camden, O.

114,063.—Making Soap.—J. D. Sturges, Chicago, Ill.

114,064.—Drawing Frame.—G. E. Taft, Northbridge, Mass.

114,065.—Hay Rake.—F. A. Thayer, Sheldonville, Mass.

114,066.—Seed Planter.—C. J. Turner, M. L. Wilkinson, Olean, N. Y.

114,067.—Shoe.—Charles E. Tyler, Georgetown, Mass.

114,068.—Punching Metal.—I. Van Hagen, Chicago, Ill.

114,069.—Recoloring Fabrics.—J. M. Wallace, New York.

114,070.—Grater.—H. C. White, Philadelphia, Pa.

114,071.—Sewing Machine.—F. E. Whiteside, Oxford, Pa.

114,072.—Gear for Carriages.—Eli Wigle, Bay City, Mich.

114,073.—Stave Equalizer.—H. S. Wiley, Madison, Ind.

114,074.—Spinning Machine.—S. M. Williams and H. M. Williams, Coldwater, Mich.

114,075.—Fireplace.—J. E. Wood, Webster, Ohio.

114,076.—Corn Harvester.—A. N. Woodard, Fentonville, Mich.

114,077.—Knitting Machine.—H. Woodman, Saco, Me.

114,078.—Valve.—P. N. Woods, Fairfield, Iowa.

114,079.—Gain Cutter.—E. H. Woodsum, Harrison, Me.

114,080.—Fork.—B. Wright and W. C. Park, Cardiff, N. Y.

114,081.—Firearm.—J. Abbey and J. H. Foster, Chicago, Ill.

114,082.—Camera Boxes.—O. Ackerman, Carthage, N. Y.

114,083.—Vacuum Engine.—H. W. Adams, Philadelphia, Pa.

114,084.—Passenger Recorder.—G. H. Aldrich, New York.

114,085.—Plane Iron.—I. Almy and S. A. Drake, Covert, N.Y.

114,086.—Paint Brush.—J. Ames, Jr., Lansingburg, N. Y.

114,087.—Paper Feeding Machine.—E. R. Andrews, R. B. Randall, and W. H. Clague, Rochester, N. Y.

114,088.—Potato Digger.—S. E. Anthony, Stillwater, N. Y.

114,089.—Cooper's Croze.—J. F. Applegate and C. Feiock, Albany, Ind.

114,090.—Flux for Iron and Steel.—E. T. Atwood, Minerva, Ohio.

114,091.—Glove.—E. W. and A. A. Avery, Plymouth, N. H.

114,092.—Elevating Water.—J. A. Ayres, Hartford, Conn.

114,093.—Washing Machine.—J. S. Balsly, North Bend, Ky.

114,094.—Harvester Rake.—John Barnes, Rockford, Ill.

114,095.—Kiln.—Arthur Batchelar, Brockham, England.

114,096.—Bevel.—E. A. Bell, Meriden, Conn.

114,097.—Grain Separator.—Daniel Best, Yuba, Cal.

114,098.—Polishing Machine.—S. Bevan, Philadelphia, Pa.

114,099.—Ticket Case.—J. F. Birchard, Milwaukee, Wis.

114,100.—Brake.—S. R. Bolton, Prescott, Mo.

114,101.—Gate.—R. T. Browne, Fallston, Md.

114,102.—Ventilator.—John Bradley, New York city.

114,103.—Buckwheat Refiner.—Daniel D. Brewster, West Laurens, N. Y.

114,104.—Lime Oven.—August Califf, Danville, Ill.

114,105.—Printing Press.—A. Campbell, Brooklyn, N. Y.

114,106.—Printing Press.—A. Campbell, Brooklyn, N. Y.

114,107.—Safe.—J. W. Campbell, Sr., New York city.

114,108.—Key Tag.—C. L. Carter, Washington, D. C.

114,109.—Bessemer Steel.—H. Chisholm, Cleveland, Ohio.

114,110.—Pencil Case.—J. M. Clark, Jersey City, N. J.

114,111.—Mechanical Movement.—John Corley, Kansas.

114,112.—Bed Spring.—D. V. Crandall, Chicago, Ill.

114,113.—Lamp Chimney.—T. A. Davies, New York city.

114,114.—Thread Measuring.—L. Dimock, Leeds, Mass.

114,115.—Forge Bonnet.—W. Dunkerly, Woonsocket, R. I.

114,116.—Double Tree.—M. Durnell and W. Milner, Leesburg, O.

114,117.—Spark Arrester.—W. W. Elliott, Elliott's Mills, Miss.

114,118.—Weather Strip.—L. H. Ellsworth, W. E. Wilcox, and S. Seabury, Peoria, Ill.

114,119.—Fire Escape.—G. A. England, Ripon, Wis.

114,120.—Broom Head.—C. Fiscus, Washington, D. C.

114,121.—Heel Die.—B. F. Fisk and M. B. Stone, Haverhill, Mass.

114,122.—Axle Box.—W. H. Fitz Gerald, Brooklyn, N. Y.

114,123.—Switch.—T. Fogg, St. Mary's, Canada.

114,124.—Car Coupling.—E. L. Fareman, Rantoul, Ill.

114,125.—Steam Engine.—D. R. Fraser, Chicago, Ill.

114,126.—Washing Machine.—H. A. Gaston, San Francisco, Cal.

114,127.—Cotton and Corn Chopper.—J. H. Gatling, Murfreesborough, N. C.

114,128.—Booms for Masts.—A. Gill, Holmes' Hole, Mass.

114,129.—Pulley.—J. Goodrich and H. J. Colburn, Fitchburg, Mass.

114,130.—Printing Press.—J. Gough, London, Eng.

114,131.—Horse Collar.—W. H. Gray, New York city.

114,132.—Feed-water Heater.—C. S. S. Griffing, Salem, O.

114,133.—Fertilizer.—W. B. Hamilton, New Orleans, La.

114,134.—Veneer Cutter.—T. Hanvey, Rochester, N. Y.

114,135.—Wheel Skate.—G. W. Hawk, Chicago, Ill. Antedated April 18, 1871.

114,136.—Car Spring.—B. Hershey, Erie, Pa.

114,137.—Dryer.—C. H. Hersey, Boston, Mass.

114,138.—Telegraph Pole.—Ira Hersey, New York city.

114,139.—Roofing.—D. Hitchcock and W. Gibbs, Syracuse, N. Y.

114,140.—Lamp Shade.—J. H. Hobbs, C. W. Brockemier, and W. Leighton, Jr., Wheeling, W. Va.

114,141.—Steam Trap.—J. W. Hodges, Baltimore, Md.

114,142.—Heater and Condenser.—B. Holly, Lockport, N.Y.

114,143.—Pocket Flask.—S. Hughes, Hudson, N. Y.

114,144.—Gas Cut-off.—W. Humphreys, Waterford, N. Y.

114,145.—Shoe Sole.—J. M. Hunter, New York city.

114,146.—Steam Generator.—W. H. Ivens, Trenton, N. J.

114,147.—Axle.—E. W. Ives, Hamden, Ct.

114,148.—Axle Box.—E. W. Ives, Hamden, Ct.

114,149.—Vehicle.—R. Jack, Des Moines, Iowa.

114,150.—Hay Rake.—O. S. Jarvis, Xenia, Ill.

114,151.—Puddling Furnaces.—J. A. Jones, R. Howson, and J. Gjers, Middlesborough-on-Tees, Eng.

114,152.—Latch.—A. D. Judd, New Haven, Ct.

114,153.—Milking Stool.—J. N. Knapp, Syracuse, N. Y.

114,154.—Water Wheel.—J. L. Kurtz, York, Pa.

114,155.—Shuttle.—Julius Kuttner, New York city.

114,156.—Exhausting Gas, etc.—R. Laidlaw and J. Thomson, Glasgow, G. B.

114,157.—Lubricator.—C. R. Laman, Painted Post, N. Y.

114,158.—Tweer.—F. Lawrence, Philadelphia, Pa.

114,159.—Band Cutter.—J. Lee, Jr., and J. Lee, Sr., Duquoin, Ill.

114,160.—Cooking Stove.—W. D. C. Lloyd, Louisville, Ky.

114,161.—Envelope.—P. Lockwood, Auburn, Ind.

114,162.—Balance Valve.—K. H. Loomis, New York city. Antedated April 19, 1871.

114,163.—Furnace.—P. W. Mackenzie, Blauveltville, N. Y.

114,164.—Pipe Mold.—T. Madeley, Rochester, N. Y.

114,165.—Harvester Rake.—J. P. Manny, Rockford, Ill.

114,166.—Harvester Rake.—J. P. Manny, Rockford, Ill.

114,167.—Shuttle.—E. W. Marble, Sutton, Mass.

114,168.—Horse Power.—D. G. Marden, Memphis, Tenn.

114,169.—Wheel Fellies.—D. J. Marston, Amesbury, Mass.

114,170.—Plow Handle.—E. G. Matthews, Oakham, Mass.

114,171.—Wood Bending.—E. G. Matthews, Oakham, Mass.

114,172.—Pavement.—F. E. Matthews, Chicago, Ill.

114,173.—Dumping Wagon.—S. D. and W. McCaleb, Louisville, Ky.

114,174.—Roofing.—D. W. McConnell and W. W. Pierce, Buffalo, N. Y.

114,175.—Extracting Metals.—W. P. McConnell, Washington, D. C.

114,176.—Water Elevator.—A. A. and R. P. McPheeters, Arbor Hill, Va.

114,177.—Gate.—J. L. Meredith, Bloomingsburg, Ind.

114,178.—Fence.—Levi Moore, Baraboo, Wis.

114,179.—Wrench.—F. B. Morse, Plantsville, Conn.

114,180.—Scroll Saw.—J. S. Moseley, Syracuse, N. Y.

114,181.—Stove-pipe Cleaner.—D. Murphy, Richmond, Va.

114,182.—Corn Harvester.—R. L. Nelson, Orange Court House, Va.

114,183.—Mortising Machine.—R. L. Nelson, Orange Court House, Va.

114,184.—Trace Buckle.—G. Oldham, Jr., Cuba, N. Y.

114,185.—Earth Auger.—T. Orchard, Sacramento, Cal.

114,186.—Photographer's Tank.—J. W. Osborne, Brooklyn, N. Y.

114,187.—Pile for Nut Blanks.—J. Ostrander, Manchester, Va.

114,188.—Pile for Nut Blanks.—J. Ostrander, Manchester, Va.

114,189.—Fence Post.—J. A. Otis, Watertown, N. Y.

114,190.—Wood Pavement.—H. E. Paine, Milwaukee, Wis.

114,191.—Electro-plating of Tubes.—D. D. Parmelee, New York city.

114,192.—Refining Sugar.—A. F. W. Partz, Oakland, Cal. Antedated April 22, 1871.

114,193.—Drill Cylinder.—C. S. Pattison, North Adams, Mass.

114,194.—Lubricator.—W. E. Phillips, Silver City, Idaho Territory.

114,195.—Trunk Fastening.—L. Ransom, Lansingburg, N.Y.

114,196.—Switch.—P. V. M. Raymond, Charles City, Iowa.

114,197.—Sewing Machine.—G. Rehfuss, Philadelphia, Pa.

114,198.—Advertising Device.—W. Reiff, Philadelphia, Pa.

114,199.—Folding Chair.—F. W. Richardson, New York city.

114,200.—Button Fastener.—A. M. Richmond, New York city.

114,201.—Trace Buckle.—W. G. Riley, Sullivan, Ind.

114,202.—Feed Water Steam Boilers.—Thomas Roberts, Baltimore, Md.

114,203.—Harvester.—Martin Rohrer, Polo, Ill.

114,204.—Wire Thread for Leather.—Chas. Rowland, Washington, D. C., and Nathan F. English, Hartland, Vt.

114,205.—Pole for Horse Cars.—A. G. Safford, Boston, Mass.

114,206.—Gas Regulator.—H. Shutte, Kansas City, Mo.

114,207.—Railway Switch.—Geo. H. Scougale, Carson City, Nevada.

114,208.—Cooking Stone.—J. Segondy and M. Ravolo, St. Louis, Mo.

114,209.—Window Shades.—J. Shorey and W. D. Butler, Lowell, Mass.

114,210.—Porcelain Knob Machine.—T. J. Sloan, Bronxville, N. Y.

114,211.—Water Wheel.—E. L. Small, Urbana, Ohio.

114,212.—Clevis.—J. B. Small and F. F. Holbrook, Boston, and G. Matthews, Oakham, Mass.

114,213.—Truck.—A. V. Smith, San Francisco, Cal.

114,214.—Buckle.—E. A. and D. L. Smith, Waterbury, Conn.

114,215.—Grist Mill and Huller.—J. W. Smith, Columbus, Ga.

114,216.—Boiler Alarm.—John Stanton, Philadelphia, Pa.

114,217.—Trunk Lock.—Jos. Stanton, Buffalo, N. Y.

114,218.—Veneer.—Benj. D. Stevens, Prairie du Chien, Wis.

114,219.—Fire Kindling.—J. W. Still, San Francisco, Cal.

114,220.—Plow.—W. H. Stone, Lebanon, Mich.

114,221.—Plow.—A. L. W. Stroud, Munford, Ala. Antedated April 19, 1871.

114,222.—Boiler.—Daniel Sullivan, Bangor, Me.

114,223.—Hair Dressing.—F. R. Taylor, Waverly, N. Y.

114,224.—Ash Sifter.—G. W. Taylor, Baltimore, Md.

114,225.—Bed Bottom.—A. E. Thayer, Philadelphia, Pa.

114,226.—Seed Drill.—J. H. Thomas, Springfield, Ohio.

114,227.—Grain Drill.—J. H. Thomas, Springfield, Ohio.

114,228.—Envelope.—J. S. Thompson, Philadelphia, Pa.

114,229.—Drill.—W. H. Thorne, Philadelphia, Pa.

114,230.—Breech-loading Firearm.—F. Tiesing and Chas. Gerner, New Haven, Conn.

114,231.—Clothes Wringer.—W. H. Towers, Boston, Mass.

114,232.—Seeder.—J. T. Trowbridge, Akron, Ohio.

114,233.—Fuse.—Richard Uren, Santa Cruz, Cal.

114,234.—Extract of Meat.—M. S. Valentine, Richmond, Va.

114,235.—Circular Saws.—D. W. Washburn, Brewer, Me.

114,236.—Bale Tie.—F. Watkins, Birmingham, England.

114,237.—Plow.—A. Weaber, Lebanon, Pa.

114,238.—Water Closet.—D. Wellington, Boston, Mass.

114,239.—Mail Bag.—M. V. B. White, Fort Edwards, N. Y.

114,240.—Balance Wheel.—F. W. Wild, Baltimore, Md.

114,241.—Horse Stall.—J. Wilkinson, Baltimore, Md.

114,242.—Dental Plates.—R. H. Winsborough, St. Louis, Mo.

114,243.—Reflector.—H. S. Wood and Jacob W. Morrison, Chicago, Ill.

114,244.—Harrow.—C. Wyckoff, Jr., Fairview, Ill.

114,245.—Condenser.—J. Yates and E. Deuell, Brooklyn, N.Y.

114,246.—Blackboard.—R. W. Young, Rising Sun, Ind.

114,247.—Hot Air Register.—Wm. Young, Easton, Pa.

REISSUES.

4,349.—Fluting Machine.—Henrietta H. Cole, New York city.—Patent No. 55,469, dated June 12, 1866.

4,350.—Piston Packing.—Orrin Collier, Sacramento, Cal.—Patent No. 98,232, dated December 28, 1869.

4,351.—Fall Leaf Extension Table.—Jacob Dourson, Columbus, Ohio.—Patent No. 87,629, dated March 16, 1869.

4,352.—Disinfectant or Carbolic Acid Soap.—C. J. Eames and C. A. Seeley, New York city.—Patent No. 65,186, dated May 28, 1867.

4,353.—Stanchion.—Walter C. Clifford, Jamestown, N. Y.—Patent No. 105,445, dated July 19, 1870.

4,354.—Lock Nut.—James H. Gridley, Washington, D. C.—Patent No. 62,483, dated February 26, 1867.

4,355.—Lightning Rod.—Lewis King, East Cleveland.—Patent No. 49,633, dated August 29, 1865.

4,356.—Pump Valve.—Wm. H. Pollard, Seneca Falls, N. Y.—Patent No. 73,038, dated January 7, 1868.

4,357.—Machine for Bending Wood.—Condit Prudden, Philadelphia, Pa.—Patent No. 54,012, dated April 17, 1866.

4,358.—Saddle or Sweat Cloth.—Robert Spencer, Newark, N. J.—Patent No. 41,944, dated March 15, 1864.

DESIGNS.

4,836.—Inkstand.—F. D. Alling, Rochester, N. Y.

4,837.—Lard Pail.—J. J. Brockeé, New York city.

4,838.—Railway Car.—M. Buell and W. W. Lesley, New Castle, Del.

4,839.—Envelope Blank.—G. Cade, Long Branch, N. J.

4,840.—Mosquito Netting.—T. Carmichael, Newark, N. J.

4,841.—Show Case.—G. P. Farmer, Brooklyn, N. Y.

4,842.—Show Case.—G. P. Farmer, Brooklyn, N. Y.

4,843.—Cottage Front.—C. Graham, Elizabeth, N. J.

4,844.—Front of House.—C. Graham, Elizabeth, N. J.

4,845.—School Desk.—G. H. Grant, Richmond, Ind.

4,846.—Clock Front.—J. Moore, Jr., Brooklyn, N. Y.

4,847.—School Desk.—C. F. Palmer, Utica, N. Y.

4,848.—Saw Vise.—W. A. Perkins, Salem, Mass.

4,849.—Toy Engine.—E. P. Rider, New York city.

4,850.—Sash Weight.—W. H. Short, Brooklyn, N. Y.

4,851.—Gas Fitting.—F. E. Thomas, New York city.

4,852.—Faucet Holder.—Carl Tielenius, New York city.

TRADE MARKS.

227.—Stove Polish.—R. E. Cherrington, South Boston, Mass.

228.—Printers' Ink.—C. E. Johnson, Philadelphia, Pa.

228.—Pigment.—J. H. Nason, Boston, Mass.

230.—Cigars.—J. C. Smith & Son, Baltimore, Md.

EXTENSIONS.

Harvester.—E. D. Buckman, Philadelphia, Pa., and S. A. Sisson, of Queensburg, Vt., executors of S. S. Allen, deceased.—Letters patent No. 16,957, dated April 7, 1857.

Grinding Saws.—D. S. Nippes, Upper Merion township, Pa., administrator of Albert S. Nippes, deceased.—Letters Patent No. 17,110, dated April 21, 1857.

Mychine for Splitting Wood.—Wm. L. Williams, New York city.—Letters Patent No. 17,061, dated April 14, 1857; reissue No. No. 2,132, dated December 19, 1865.

Securing the Doors of Hay Presses, etc.—C. Martratt, of Waterford, N. Y., Letters Patent No. 17,108, dated April 21, 1857.

Blind Fastening.—H. Vansands, Middletown, Conn.—Letters Patent No. 17,243, dated May 5, 1857; reissue No. 3,392, dated April 20, 1869.

DISCLAIMER.

Machine for Splitting Wood.—W. L. Williams, New York city.—Letters Patent No. 17,061, dated April 14, 1857; reissue No. 2,132, dated December 19, 1865. Disclaims fourth claim.

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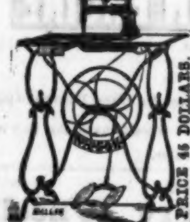

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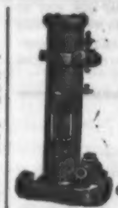

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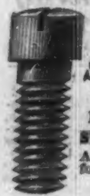
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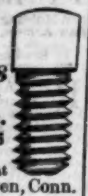

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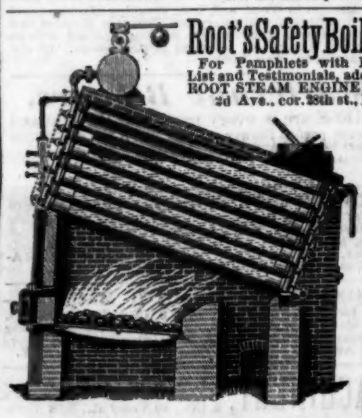
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